FUEL

CONTENTS

E13AA--

CONTINUED ON NEXT PAGE

WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: impact sensors, SRS diagnosis unit, SRS warning lamp, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

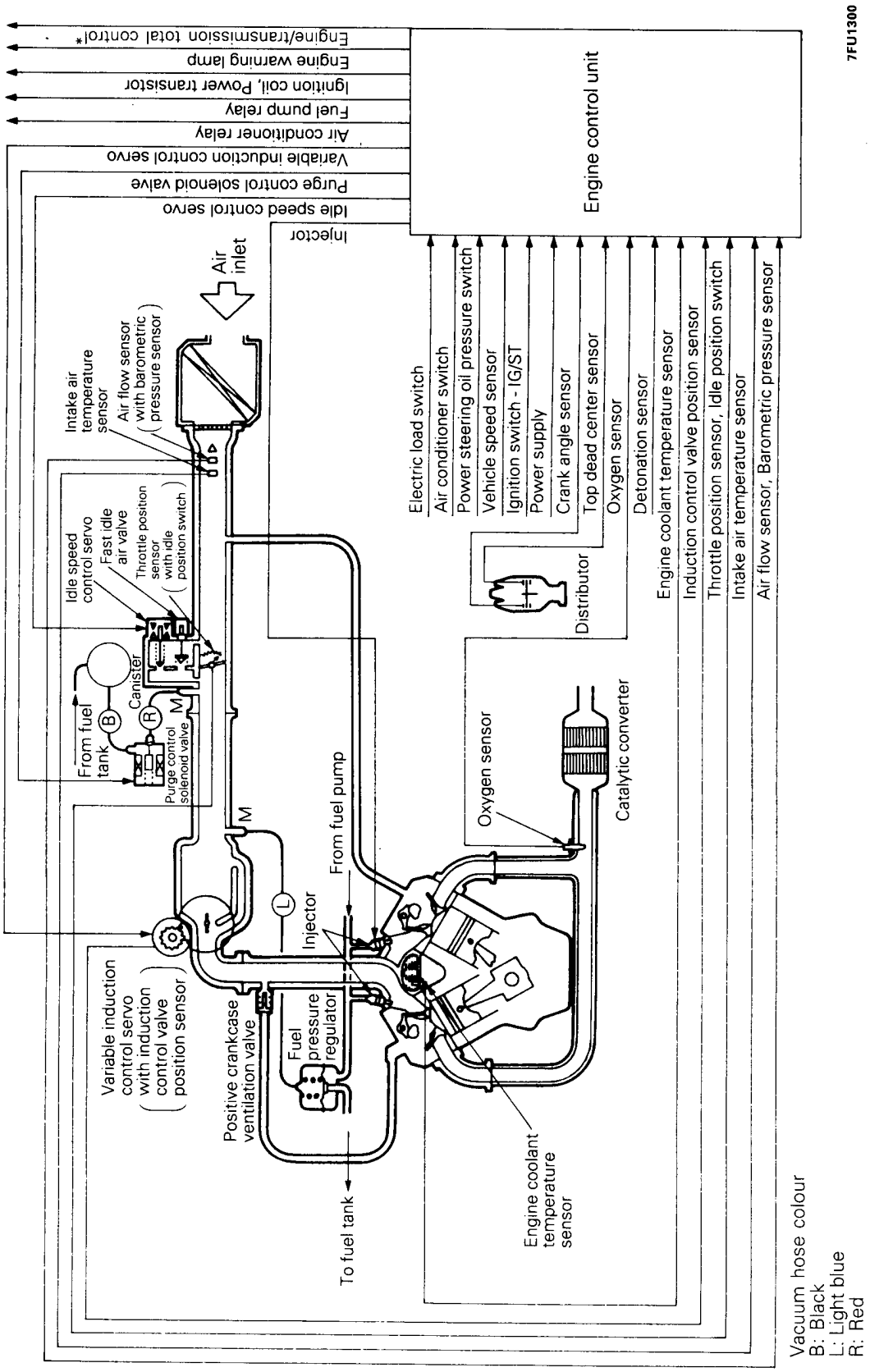
NOTE

GENERAL INFORMATION

MULTI POINT INJECTION SYSTEM DIAGRAM

E13BBAE

<SOHC-Vehicles built up to November, 1992>



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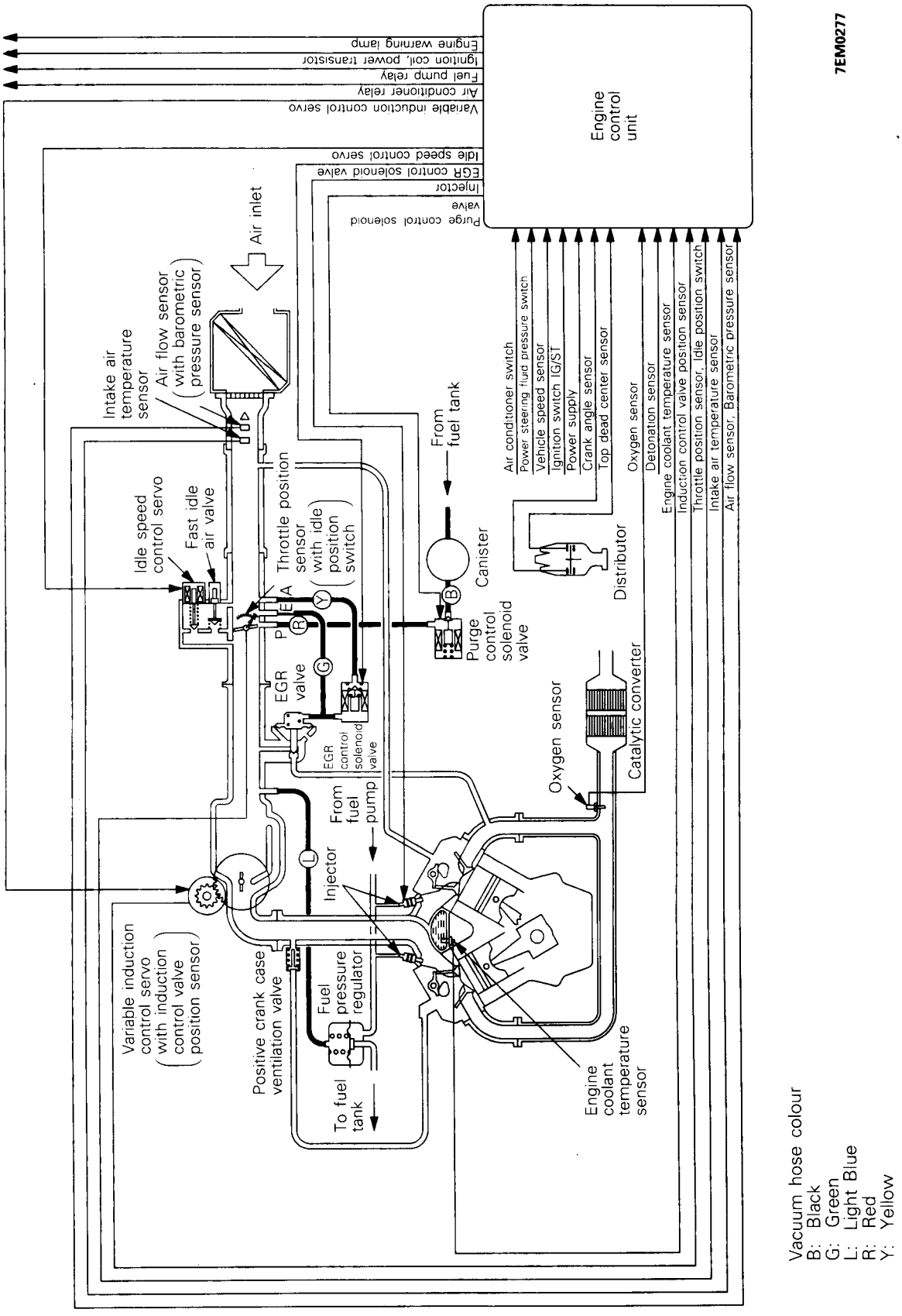
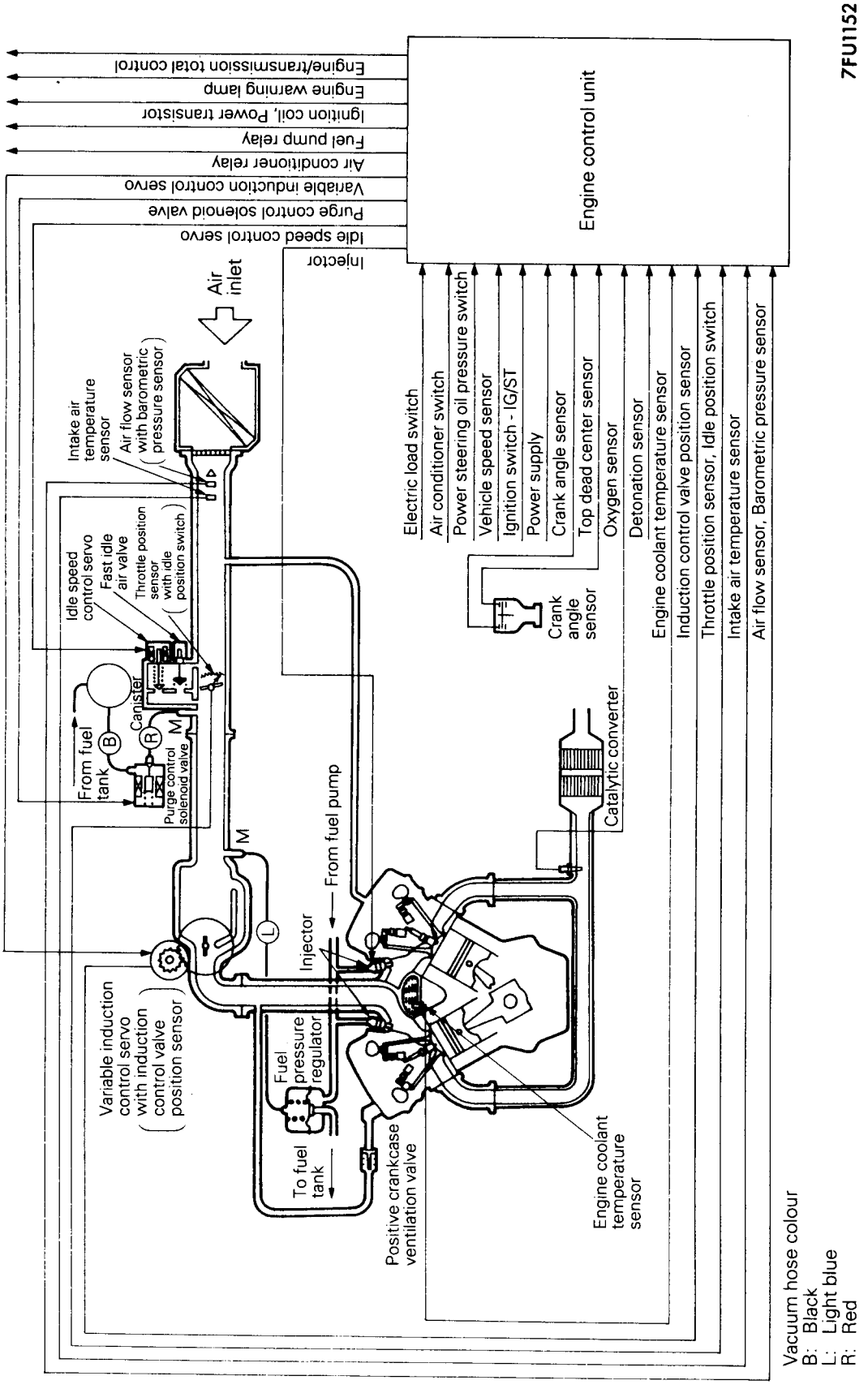


<DOHC-Except for Vehicles with TCL-Vehicles built up to November, 1992>



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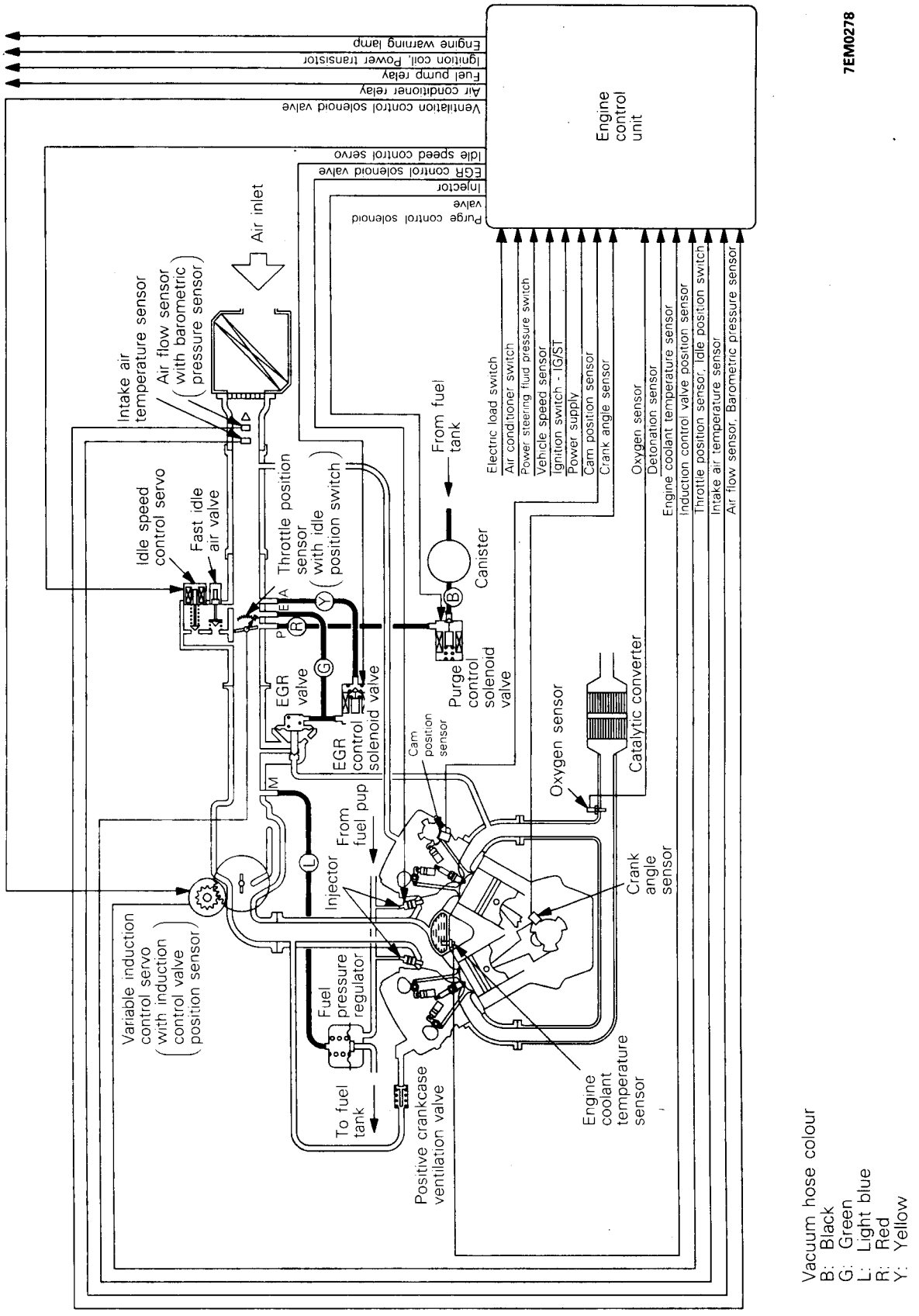

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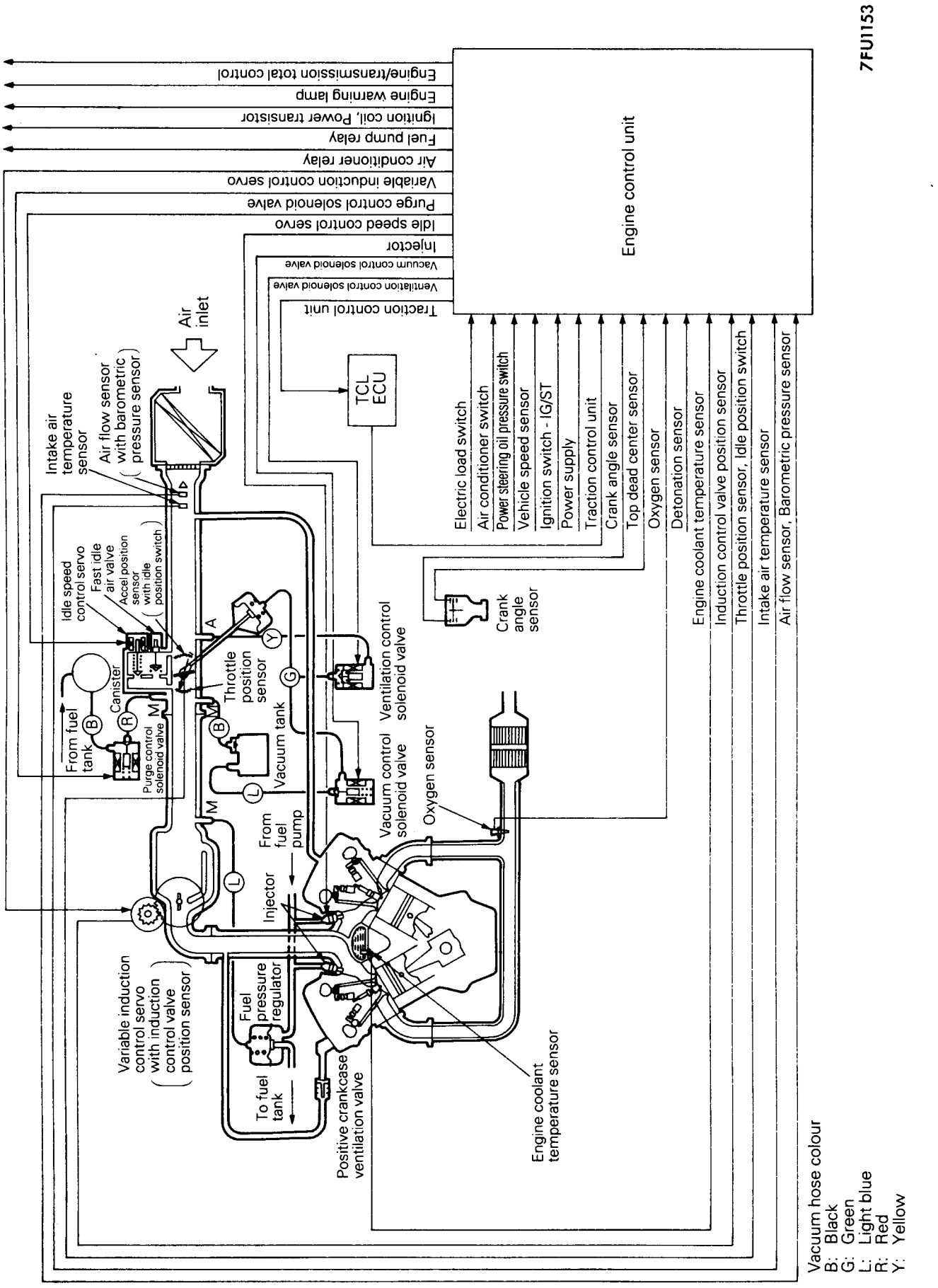

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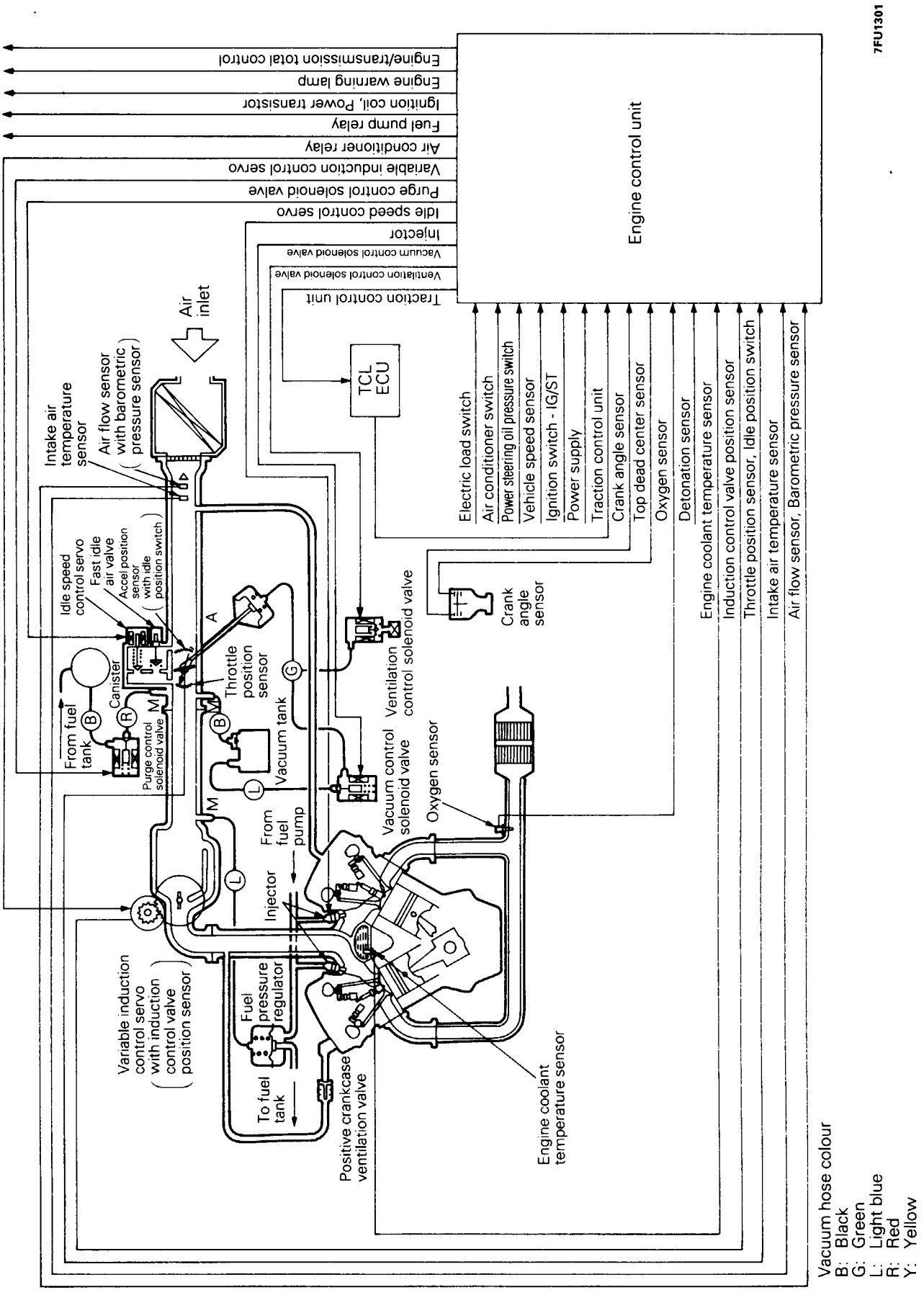
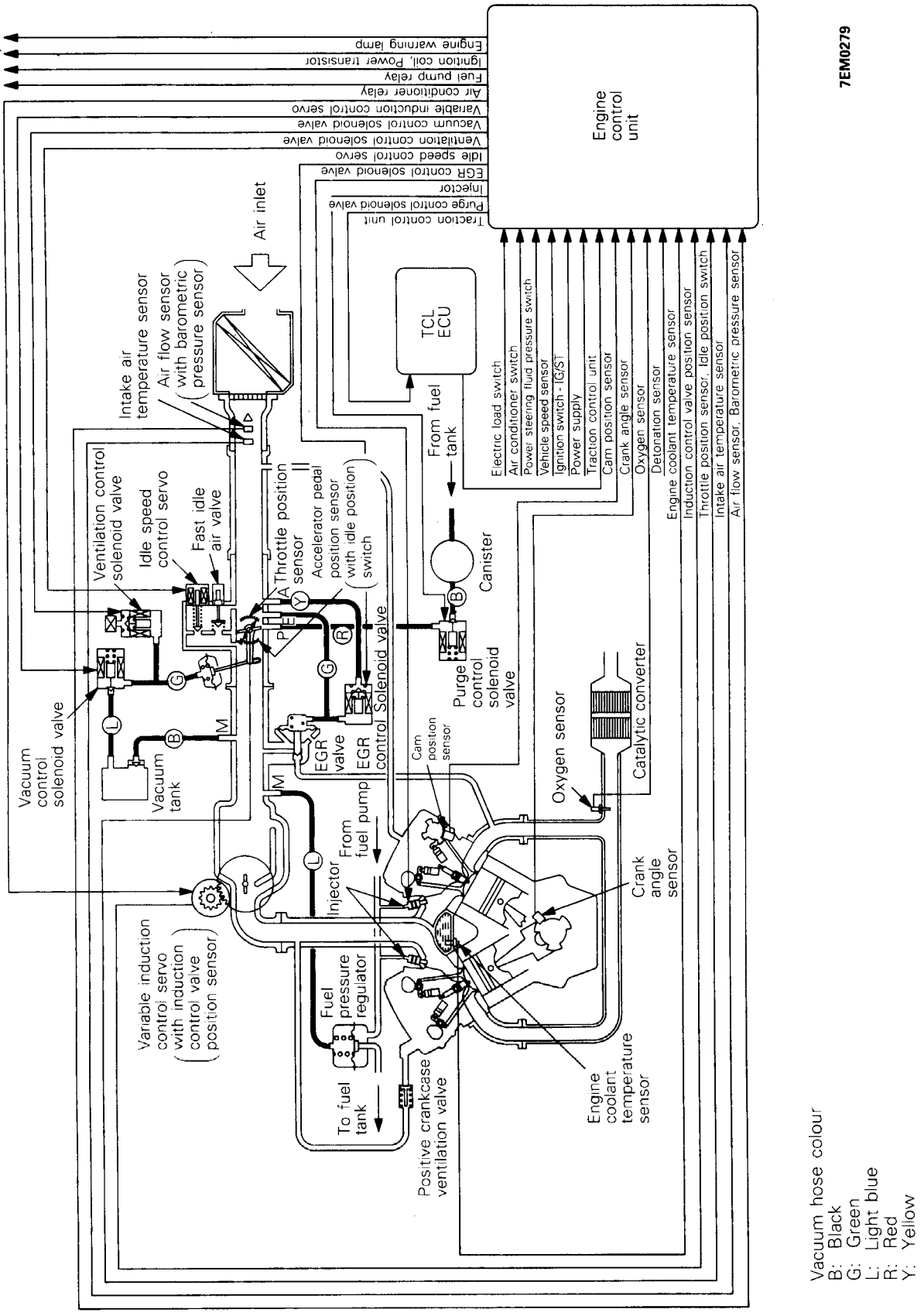


<Vehicles with TCL-Vehicles built from December, 1992>



SPECIFICATIONS

GENERAL SPECIFICATIONS

E13CA--

Items	Specifications
Fuel	
Tank capacity lit. (U.S.gal., Imp.gal.)	72 (19.0, 15.8)
Fuel pump	
Type	Electrical, in-tank type
Throttle body	
Throttle bore mm (in.)	60 (2.36)
Throttle position sensor	Variable resistor type
Accele position sensor <Vehicles with TCL>	Variable resistor type
Idle speed control servo	Stepper motor type [Stepper motor type bypass air control method with fast idle air valve (FIAV) attached]
Idle position switch <Except for Vehicles with TCL>	Contact type (with throttle position sensor)
Idle position switch <Vehicles with TCL>	Contact type (with accele position sensor)
Engine control unit	
Identification model No.	
<SOHC>	E2T35777*1, E2T60778*2
<DOHC-Except for Vehicles with TCL>	E2T35780*1, E2T60776*2
<Vehicles with TCL>	E2T35784*1, E2T60777*2
Sensor	
Air flow sensor (AFS)	Karman vortex type
Barometric pressure sensor	Semiconductor diffusion-type
Intake air temperature sensor	Thermistor type
Engine coolant temperature sensor	Thermistor type
Oxygen sensor	Zirconia type
Vehicle speed sensor	Reed switch type
Inhibitor switch	Contact switch type
Top dead centre sensor	Photointerrupter-type*1
Camshaft position sensor (Top dead centre sensor)	Hall element type*2
Crank angle sensor	Photointerrupter-type*1 Hall element type*2
Actuators	
Control relay type	Contact switch type
Injector type and number	Electromagnetic 6
Purge control solenoid valve	ON/OFF type solenoid valve
EGR control solenoid valve	Duty cycle type solenoid valve
Vacuum control solenoid valve	Duty cycle type solenoid valve
Ventilation control solenoid valve	Duty cycle type solenoid valve

NOTE
(1) The*1 symbol is applicable to vehicles built up to November, 1992
(2) The*2 symbol is applicable to vehicles built from December, 1992

Items		Specifications
Auto-cruise control switch		
Resistance	Ω	
SET		2700 ± 135
RESUME		820 ± 41
Auto-cruise control unit		
Set error	km/h (mph)	$0\ ^{0}_{-1.0}$ ($0\ ^{0}_{-0.6}$)
Range of speed control	km/h (mph)	40–200 (25–125)
Actuator		
Drive system		Vacuum type
Stroke	mm (in.)	38–42 (1.5–1.7)
Auto-cruise control vacuum pump		
Rated load	A	0.4 or less

SERVICE SPECIFICATIONS

E13CB--

Items		Specifications
Standard value		
Accelerator cable play	mm (in.)	
<M/T>		1–2 (0.04–0.08)
<A/T>		3–5 (0.12–0.20)
Accelerator switch switching point	mm (in.)	2–6 (0.08–0.24)
Fuel pressure regulator pressure	kPa (kg/cm^2, psi)	
Vacuum hose disconnection		330–350 (3.3–3.5, 47–50)
Vacuum hose connection		Approx. 270 (2.7, 38)
Idling speed control (ISC) adjustment	r/min	
		700 ± 50
Throttle-position sensor (TPS) adjustment voltage (at curb idle)	mV	400–1000 <Except for Vehicles with TCL> 580–690 <Vehicles with TCL>
Accele position sensor adjustment voltage (at curb idle) <Vehicles with TCL>	mV	400–1000
Throttle body		
Throttle position sensor (TPS) resistance	kΩ	3.5–6.5
Accele position sensor resistance <Vehicles with TCL>	kΩ	3.5–6.5
ISC servo motor coil resistance	Ω [at 20°C (68°F)]	28–33
Input sensor		
Intake air temperature sensor resistance	kΩ [at 20°C (68°F)]	2.7
Engine coolant temperature sensor resistance	kΩ	
20°C (68°F)		2.4
80°C (176°F)		0.3
Oxygen sensor output voltage	V	0.6–1.0

Items	Specifications
Output actuator	
Injector coil resistance Ω [at 20°C (68°F)]	13–16
Purge control solenoid valve resistance Ω [at 20°C (68°F)]	36–44
Vacuum control solenoid valve resistance Ω [at 20°C (68°F)]	36–44
Ventilation control solenoid valve resistance Ω [at 20°C (68°F)]	36–44
Auto-cruise control system	
Accelerator cable play mm (in.)	
<M/T>	0–1 (0–0.04)
<A/T>	2–3 (0.08–0.12)
Throttle cable play mm (in.)	1–2 (0.04–0.08)
Auto-cruise cable play mm (in.)	1–2 (0.04–0.08)
Control Valve, Release Valve resistance Ω	50–60

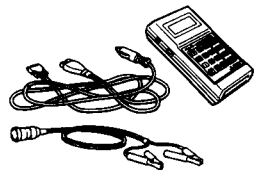
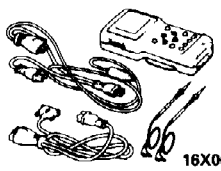
SEALANTS

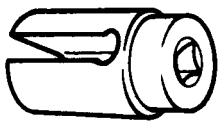
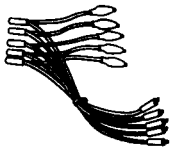
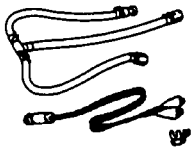
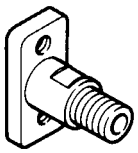
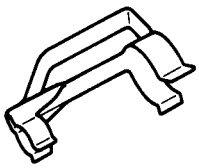
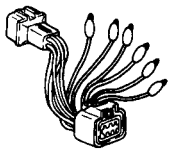
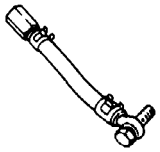
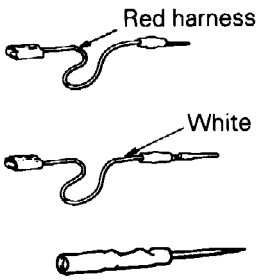
E13CE--

Item	Specified sealant	Quantity
Engine coolant temperature sensor threaded part	3M Nut Locking Part No. 4171 or equivalent	As required

SPECIAL TOOLS

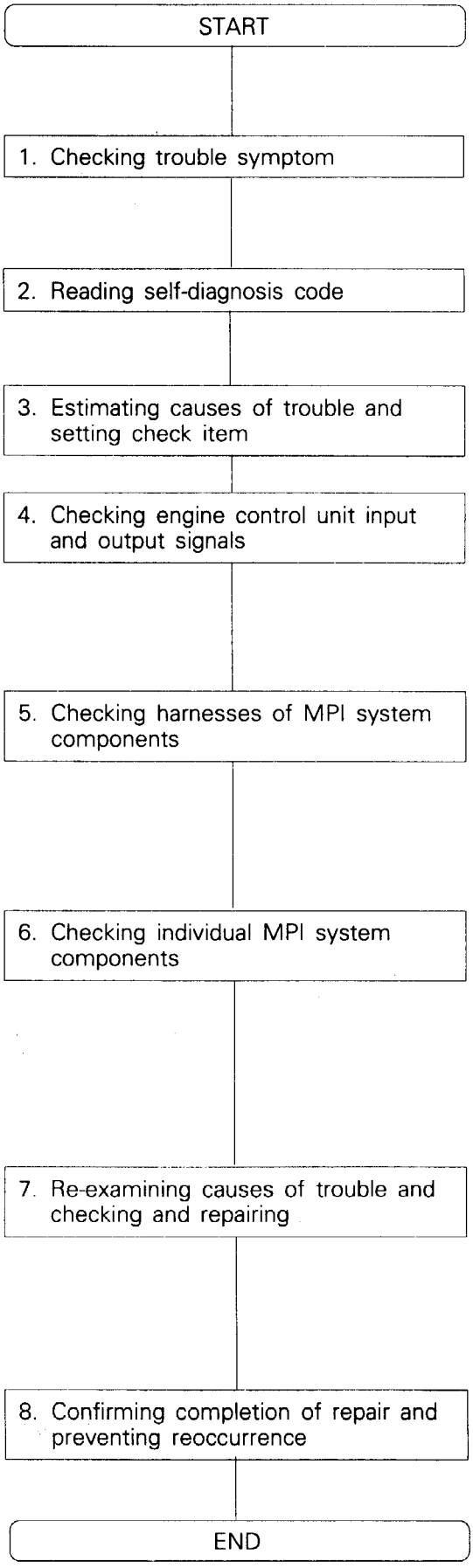
E13DA--

Tool	Number	Name	Use
	MB991341	Multi-use tester sub assembly	Up to 1993 models • Reading diagnosis code • MPI system inspection • Auto-cruise control system inspection
		ROM pack (for multi-use tester) (For the number, refer to GROUP 00 – Precautions Before Service.)	
 16X0606	MB991502	MUT-II	All models • Reading diagnosis code • MPI system inspection • Auto-cruise control system inspection
 16X0607		ROM pack	

Tool	Number	Name	Use
	MD998773	Detonation sensor wrench	Removal/installation of detonation sensor
	MB991348	Test harness set	• Idle switch and throttle position sensor adjustment • Inspection with analyzer
	MD998706	Injector test set	Inspection of injector
	MD998741	Injector test adaptor	
	MD998746	Clip	
	MD998463	Test harness (6 pin, square)	• Inspection of ISC servo • Inspection with analyzer
	MD998709	Adaptor hose	Fuel pressure measurement
	MB991223	Test harness set for inspection • Pin contact pressure inspection harness • Probe for ordinary tester connection (for general connector)	• Inspection of oxygen sensor • Measurement of terminal voltage

TROUBLESHOOTING

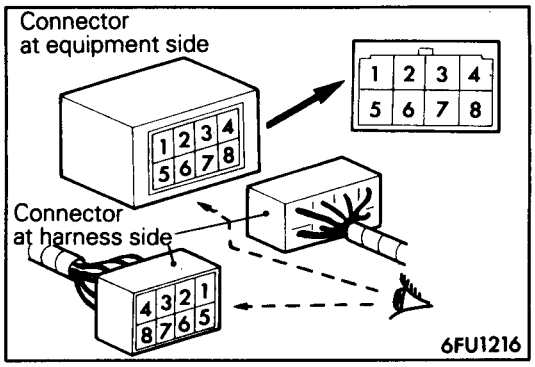
E13EFAHa



EXPLANATION OF TROUBLESHOOTING PROCEDURES

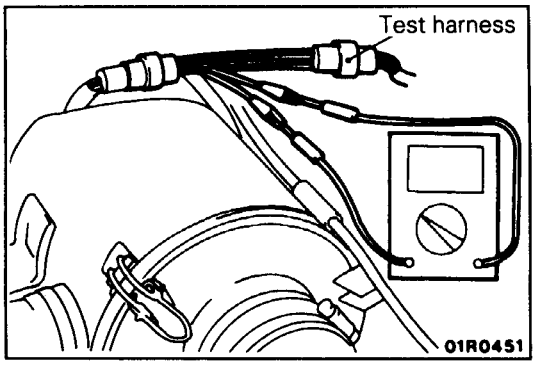
The effective troubleshooting procedures for troubles of the MPI system are explained in the following.

1. Checking trouble symptom
   - Reproduce the problem symptom and check the contents of the trouble and the conditions under which the symptom occurs (engine condition, operating state, etc.).
2. Reading self-diagnosis code
   - Read the self-diagnosis code and when a fault code is output, correct the fault referring to the diagnostic chart.
3. Estimating causes of trouble and setting check item
   - Referring to CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS, determine the check items and procedures to be followed.
4. Checking engine control unit input and output signals
   - Using a multi-use tester or analyzer, check the input and output signals of the engine control unit.
   - If the input and output signals are normal, the sensor input/actuator control is judged as normal. Then, check the input and output signals of the next check item.
5. Checking harnesses of MPI system components
   - If the input and output signals of the engine control unit are not normal, check the body harnesses of the MPI system components and repair as necessary.
   - After repair, check the input and output signals of the engine control unit again. If they are normal this time, check the input and output signals of the next check item.
6. Checking individual MPI system components
   - If the body harnesses are normal but the input and output signals of the engine control unit are abnormal, check the MPI system components individually and repair or replace as necessary.
   - After repair or replacement, check the input and output signals of the engine control unit again. If they are normal this time, check the input and output signals of the next check item.
7. Re-examining causes of trouble and checking and repairing
   - If the harness check and individual component check have resulted normal but the input and output signals of the engine control unit are abnormal, re-examine the causes of trouble referring to the troubleshooting hints.
     Then, check and repair including other groups.
8. Confirming completion of repair and preventing reoccurrence
   - Try to reproduce the problem symptom to make sure that the symptom will not occur again.
   - Remove the true cause of the trouble to prevent its reoccurrence.

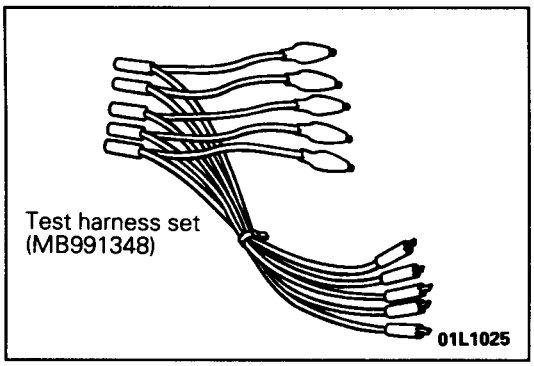


EXPLANATION AND PRECAUTION RELATED TO HARNESS CHECKING

- Connector symbols are described as seen from the terminal end for the connector.

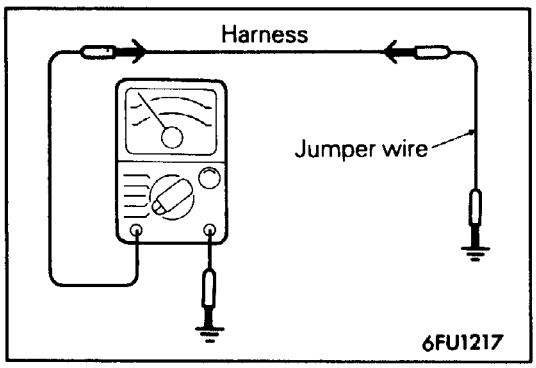


- Be sure to use the special tool (test harness) when, for a waterproof connector, checking while the circuit is conductive.
  If a probe is inserted from the harness side, the waterproof capability will be lowered, thereby causing/corrosion, so never do so.
- When a connector is disconnected in order to check terminal voltage, etc., never insert a probe if the terminal to be checked is a female pin, because the forceful insertion of a probe will cause improper or incomplete contact.

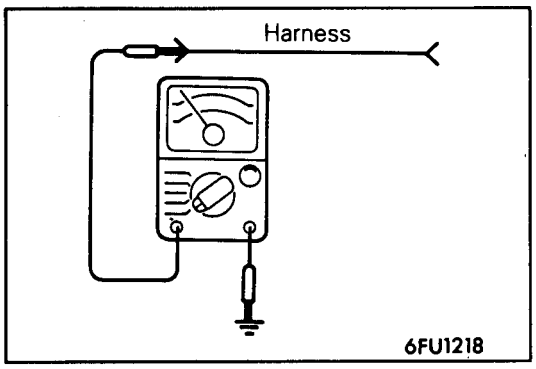


Also, if there is no test harness that is compatible with the connector, it the test harness set (MB991348) that can be directly connected between the terminals may be use.

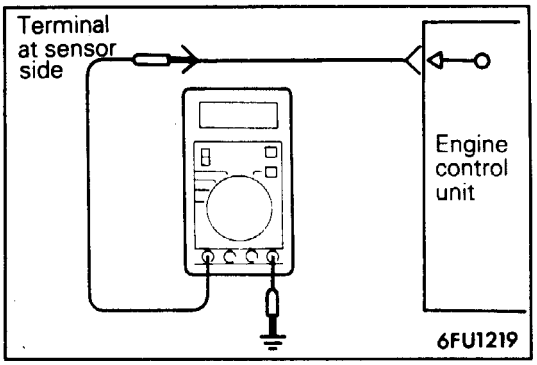
When a connector is disconnected to check the terminal voltages, etc., never insert a probe if the terminal to be checked is a female pin. Use the special tool (Test harness set: MB991223) instead. By forcibly inserting a probe, the contact can be damaged.



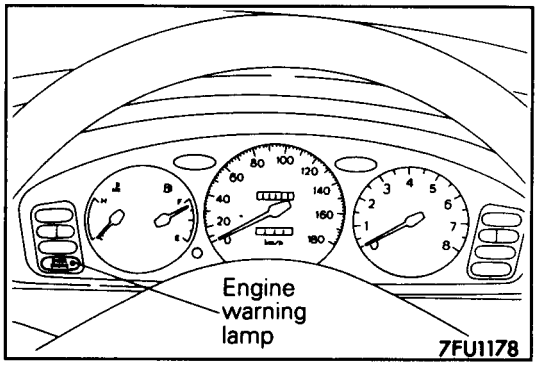
- When checking for damaged or disconnected wiring of a harness (open circuit) and if both ends of the harness are unconnected, use a jumper wire to earth one end of the harness, and then check for continuity between the other end and earth. By doing this, you can check for damaged or disconnected wiring, and, if there is no continuity, the harness should be repaired.



- When checking for a harness short-circuit (short-circuit to earth), open one end of the harness and then check for continuity between the other end and earth.
  If there is continuity, the harness is short-circuited to earth and should be repaired.



- If the voltage (power-supply voltage) supplied to a sensor is not normal, repair the harness.
  If the voltage to the sensor is still not normal after the harness has been repaired, replace the engine control unit and check again.



ENGINE WARNING LAMP (CHECK ENGINE LAMP)

Among the self-diagnosis items, an engine warning lamp comes on to notify the driver of the emission control items when an irregularity is detected.
However, when an irregular signal returns to normal and the engine control unit judges that it has returned to normal, the engine warning lamp goes out.
Moreover, when the ignition switch is turned off, the lamp goes out. Even if the ignition switch is turned on again, the lamp does not come on until the irregularity is detected.
Here, immediately after the ignition switch is turned on, the engine warning lamp is lit for 5 seconds to indicate that the engine warning lamp operates normally.

ITEMS INDICATED BY THE ENGINE WARNING LAMP

Engine control unit
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor (Top dead centre sensor)
Barometric pressure sensor
Detonation sensor
Ignition timing adjustment signal
Injector
Ignition coil, Power transistor unit <DOHC>
Vacuum solenoid valve <Vehicles with TCL>
Ventilation solenoid valve <Vehicles with TCL>

Caution
Malfunction indicator lamp will come on even when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the lamp comes on even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

ENGINE WARNING LAMP INSPECTION

(1) Check that when the ignition switch is turned ON, the lamp illuminates for about 5 seconds and then goes out.
(2) If the lamp does not illuminate, check for open circuit in harness, blown fuse and blown bulb.

SELF-DIAGNOSIS

The engine control unit monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control unit.
When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control unit judges that an irregularity has occurred, memorizes the malfunction code, and outputs the signal to the self-diagnosis output terminal.
There are 21 diagnosis items, including the normal state, and the diagnosis results can be read out with a multi-use tester. (MUT)
Moreover, since memorization of the malfunction codes is backed up directly by the battery, the diagnosis results are memorized even if the ignition key is turned off. The malfunction codes will, however, be erased when the battery terminal or the engine control unit connector is disconnected.
Furthermore, the malfunction code can also be erased by sending the malfunction code erase signal from the multi-use tester to the engine control unit with turning the ignition switch to ON.

Caution
If the sensor connector is disconnected with the ignition switch turned on, the malfunction code is memorized. In this case, send the malfunction code erase signal from the multi-use tester to the engine control unit, and the diagnosis memory will be erased.

The 21 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

Caution
The malfunction code for the ignition timing adjustment signal is output when the circuit for the ignition timing adjustment terminal is short circuited. Consequently when adjusting the ignition timing and the ignition timing adjustment terminal is earthed, the engine warning lamp will also illuminate, thus does not indicate an abnormality exists.

DIAGNOSIS CHART

Output preference order	Diagnosis item	Malfunction code		Check item (Remedy)
		No.	Memory	
1	Engine control unit	–	–	(Replace engine control unit)
2	Oxygen sensor	11	Retained	• Harness and connector • Fuel pressure • Injectors (Replace it defective.) • Intake air leaks • Oxygen sensor
3	Air flow sensor	12	Retained	• Harness and connector (If harness and connector are normal, replace air flow sensor assembly.)
4	Intake air temperature sensor	13	Retained	• Harness and connector • Intake air temperature sensor
5	Throttle position sensor	14	Retained	• Harness and connector • Throttle position sensor • Idle position switch
6	Engine coolant temperature sensor	21	Retained	• Harness and connector • Engine coolant temperature sensor
7	Crank angle sensor	22	Retained	• Harness and connector (If harness and connector are normal, replace crank angle sensor assembly.)
8	Top dead centre sensor	23	Retained	• Harness and connector (If harness and connector are normal, replace crank angle sensor assembly.)
9	Vehicle speed sensor (reed switch)	24	Retained	• Harness and connector • Vehicle speed sensor (reed switch)
10	Barometric pressure sensor	25	Retained	• Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)
11	Detonation sensor	31	Retained	• Harness and connector (If harness and connector are normal, replace detonation sensor)

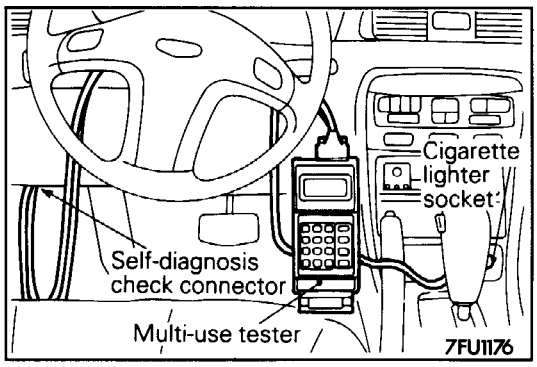
Output preference order	Diagnosis item	Malfunction code		Check item (Remedy)
		No.	Memory	
12	Ignition timing adjustment signal	36	–	• Harness and connector
13	Injector	41	Retained	• Harness and connector • Injector coil resistance
14	Ignition coil, Power transistor unit (For No. 1–4 cylinders) <DOHC>	44	Retained	• Harness and connector • Ignition coil • Power transistor unit
15	Ignition coil, Power transistor unit (For No. 2–5 cylinders) <DOHC>	52	Retained	• Harness and connector • Ignition coil • Power transistor unit
16	Ignition coil, Power transistor unit (For No. 3–6 cylinders)	53	Retained	• Harness and connector • Ignition coil • Power transistor unit
17	A cable from transmission control unit for transmission of torque reduction signal	61	Retained	• Harness and connector (If the harness and connector are normal, replace the transmission control unit.)
18	Induction control valve position sensor	62	Retained	• Harness and connector (If harness, connector and induction control valve are normal, replace air intake plenum assembly.)
19	Vacuum solenoid valve <Vehicles with TCL>	71	Retained	• Harness and connector • Vacuum solenoid valve
20	Ventilation solenoid valve <Vehicles with TCL>	72	Retained	• Harness and connector • Ventilation solenoid valve
21	Normal state	—	—	—

NOTE
1. Replace the engine control unit if a malfunction code is output although the inspection reveals that there is no problem with the check items.
2. Codes are displayed according to numerical order.

READ OUT OF MALFUNCTION CODE

PRECAUTIONS FOR OPERATION

(1) When battery voltage is low, no detection of failure is possible. Be sure to check the battery for voltage and other conditions before starting the test.
(2) Diagnosis item is erased if the battery or the engine control unit connector is disconnected. Do not disconnect the battery before the diagnosis result is completely read.
(3) The ignition switch should always be turned OFF when connecting and disconnecting the multi-use tester.



READ OUT PROCEDURE—USING MULTI-USE TESTER (MUT)

(1) Read and record the self diagnosis output.
(2) Refer to the diagnosis chart and repair the trouble.
(3) Turn the ignition switch OFF, and then turn it ON again.
(4) Erase the malfunction code.
(5) Recheck that the function is normal.

NOTE
Connect the multi-use tester to the white diagnosis connector.

DIAGNOSIS ACCORDING TO DIAGNOSIS 2 MODE

(1) Using the multi-use tester (MUT), switch the engine control unit to DIAGNOSIS 2 MODE.
(2) Test drive.
(3) As previously mentioned in "READ OUT OF MALFUNCTION CODE", read the diagnosis code and repair the trouble.
(4) Turn the ignition switch to OFF

NOTE
- By turning the ignition switch to OFF, the diagnosis mode is switched from DIAGNOSIS 2 MODE to DIAGNOSIS 1 MODE.
  <Vehicles built up to November, 1991>
- By turning the ignition switch to OFF, all self-diagnosis malfunction codes are erased.
  <Vehicles built from December, 1991>

(5) Erase the malfunction code.

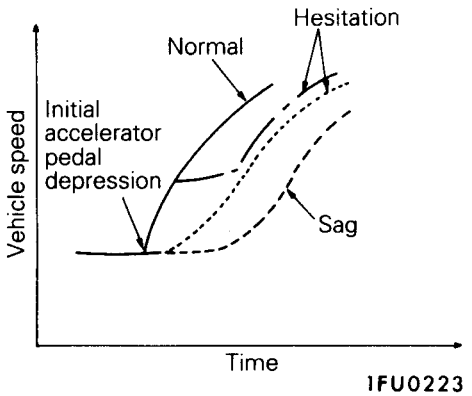
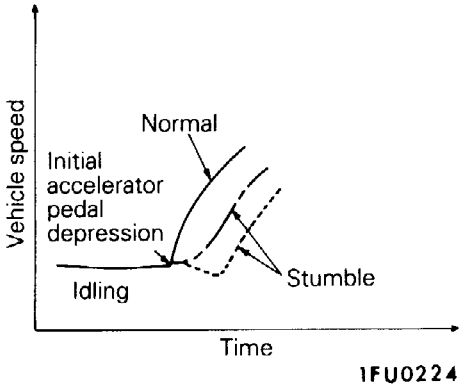
MALFUNCTION CHART

Malfunction / Inspection item	Starting		Idling stability				Driveability						Stopping	Reference page
	No starting (no initial combustion)	Poor starting (Long time to start) (Initial combustion and then engine stalls)	Unstable idling (Rough idling)	Improper idling speed	Poor sustained idling	Engine speed does not rises	Hesitation, sag	Poor acceleration	Stumble	Shock	Surge	Knocking	Dieseling	
Power supply ad ignition switch IG	① [1]													P.13-64
Engine control unit earth	② [2]													P.13-67
Fuel pump	③ [3]	① [1]			① [1]		① [1]	① [1]						P.13-68
Air flow sensor (AFS)					⑪ [10]		⑪ [11]		⑤ [5]	⑤ [5]		④ [4]		P.13-71
Air intake temperature sensor			⑤				⑦ [7]	⑥ [6]				② [2]		P.13-74
Barometric pressure sensor			⑦				⑩ [10]	⑧ [8]				③ [3]		P.13-77
Engine coolant temperature sensor		[3]	⑥ [5]	① [1]	⑤ [5]		⑨ [9]	⑦ [7]	④ [4]		③ [3]			P.13-79
Throttle position sensor (TPS)							⑧ [8]		③ [3]	④ [4]				P.13-82
Idle position switch			③ [3]	② [2]	④ [4]									P.13-85
Camshaft position sensor (Top dead centre sensor)	⑤ [5]	⑥ [7]			⑧ [7]					② [2]				P.13-90 P.13-94-1
Crank angle sensor	⑥ [6]	⑦ [8]			⑨ [8]					③ [3]				P.13-92 P.13-94-4
Ignition switch ST (M/T)	④ [4]	③ [4]												P.13-95
Ignition switch ST and inhibitor switch (A/T)	④ [4]	③ [4]		⑥										P.13-96
Vehicle speed sensor					⑥					⑥				P.13-98-2
Power steering fluid pressure switch				③										P.13-100
Air conditioner switch and air conditioner relay				④										P.13-102
Detonation sensor												① [1]		P.13-104
Electric load switch				⑤										P.13-106
Fan motor relay (radiator fan, condensor fan)				⑦	⑫ [11]									P.13-108
Induction control valve position sensor							④ [4]	④ [4]						P.13-108-2
Oxygen sensor			⑨											P.13-110
Injector	⑧ [8]	② [2]	② [2]		③ [3]		② [2]	② [2]	① [1]		① [1]		①	P.13-113
Idle speed control (ISC) servo		④ [5]	① [1]	⑧ [3]	② [2]					⑧ [7]				P.13-113
Ignition coil and power transistor	⑦ [7]				⑩ [9]			⑨ [9]		① [1]		⑤ [5]		P.13-122
Purge control solenoid valve			⑧											P.13-127
EGR control solenoid valve							⑥ [6]		⑥ [6]		④ [4]			P.13-128-1
Vacuum solenoid valve <DOHC-Vehicles with TCL>							⑫ [12]	⑩ [10]	⑦ [7]					P.13-129
Ventilation solenoid valve <DOHC-Vehicles with TCL>						① [1]	⑬ [13]	⑪ [11]	⑧ [8]					P.13-132
Variable induction control servo (DC motor)							⑤ [5]	⑤ [5]						P.13-134
Engine transmission overall control signal <DOHC A/T>										⑦ [6]	⑤ [5]			P.13-136
Engine transmission overall control signal <SOHC AT>										⑦ [6]	⑤ [5]			P.13-137-1
Traction control signal <Vehicles with TCL>			⑩ [6]	⑨ [4]			⑭ [14]	⑫ [12]	⑨ [9]		⑥ [6]			P.13-138
Fuel pressure		⑤ [6]	④ [4]		⑦ [6]		③ [3]	③ [3]	② [2]		② [2]			P.13-140

○: Hot engine (Encircled numbers indicate inspection order.)

□: Cold engine (Numbers inside a square indicate inspection order.)

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

	Items	Symptom
Starting	Won't start (no initial combustion)	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starting problem (initial combustion, then stall)	There is combustion within the cylinders, but then the engine soon stalls.
	(Starting takes a long time.)	Engine won't start quickly.
Idling stability	Idling instability (Rough idling)	Engine speed doesn't remain constant; changes during idling. Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idling.
	Incorrect idling speed	The engine doesn't idle at the usual correct speed.
	Improper idling continuity Die out Pass out	This non-continuity of idling includes the following elements. (1) Die out ..... The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not. (2) Pass out ... The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Engine r.p.m. does not rise.	Engine r.p.m. does not increase even when the accelerator pedal is depressed.
	Hesitation Sag	"Hesitation„ is the delay in response of the vehicle speed (engine rpm) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine rpm) during such acceleration. Serious hesitation is called "sag".  1FU0223
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine rpm response is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition.  1FU0224
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Dieseling	The engine continues to run even after the switch is turned OFF. This is called dieseling.

TROUBLESHOOTING

TRACTION CONTROL (TCL) SYSTEM

E13E1AAa

1. PARTICULAR PHENOMENA OF THE TCL SYSTEM

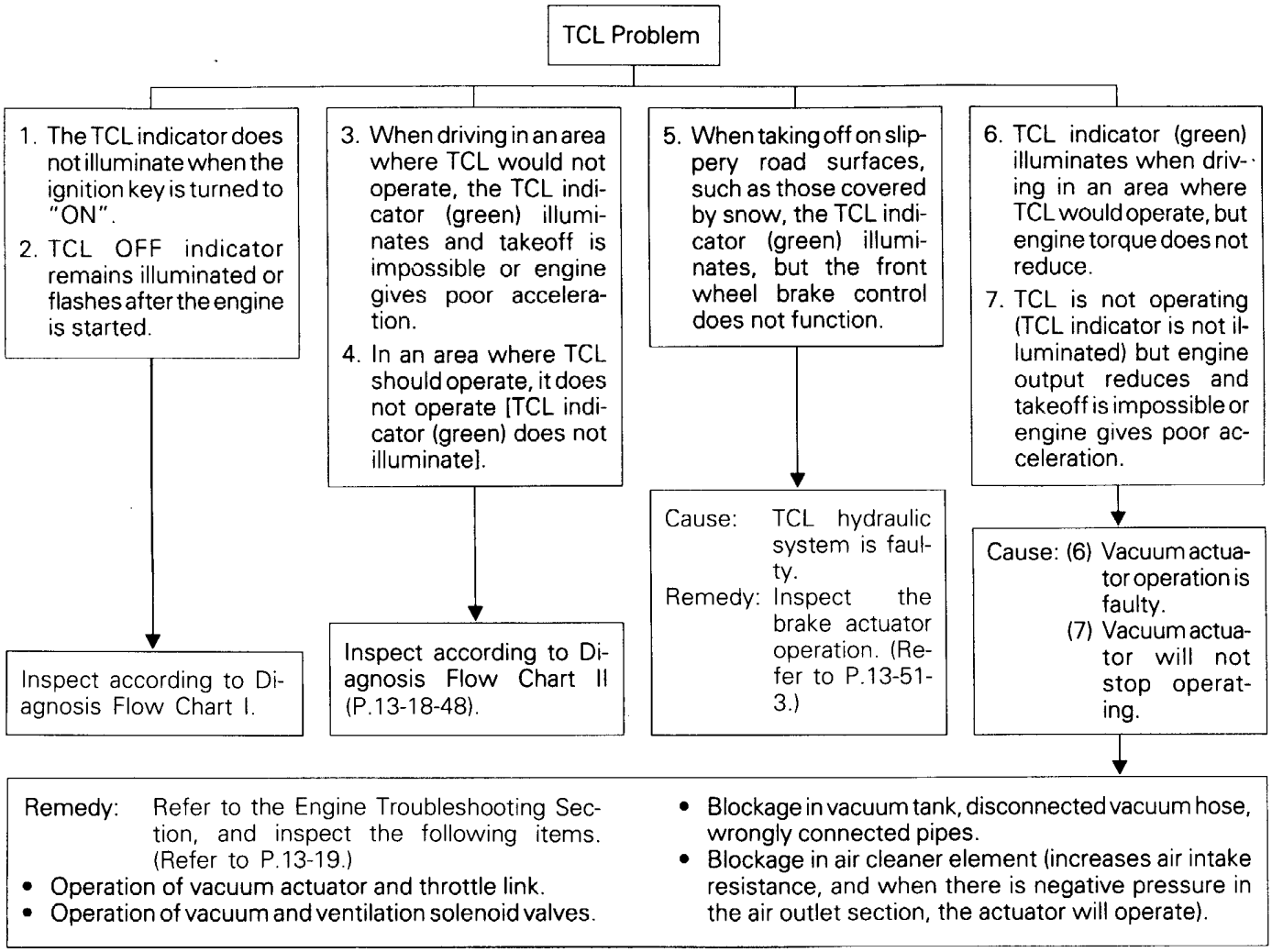
(1) On slippery road surfaces, such as those covered by snow, sometimes a vibration is felt in the vehicle when traction control is operating normally. This is due to the braking action of the slip control, and is not unusual.
(2) When the engine is started, a rattling sound can sometimes be heard inside the engine compartment and inside the vehicle. This is the sound of the ABS and TCL operation being checked, and is not unusual.
(3) When climbing very steep slopes, or if the vehicle is stuck and there is continuous pressure on the accelerator pedal for 20 seconds or more, the TCL will continue to operate, and then the TCL OFF indicator will flash and the TCL system function will stop. In this case, momentarily stop the engine, and then after approximately 7 seconds (until the engine control relay switches OFF) restart the engine. After this, when the vehicle speed has reached 20 km/h (12 mph) or more, if the TCL OFF indicator switches off, then the TCL system will operate normally from then on.
(4) If the vehicle is driven with extremely low tyre pressure, or with tyres that differ widely in diameter, the TCL system will operate even when the vehicle is moving straight, and the engine will give poor acceleration. This is because the wheel speed signal will be different from that of standard tyres. If standard tyres are fitted and the signal becomes normal, then there is no problem.

NOTE
When engine gives poor acceleration, it can be determined whether the cause is because of a problem connected to the TCL control or engine trouble by observing whether the TCL indicator (green) is illuminated or not.

2. DIAGNOSTIC PROCEDURES

Traction control system (TCL) problems have been divided into seven major sections as described below.

Each problem can be diagnosed according to the diagnosis flow chart or from the inspection summary.



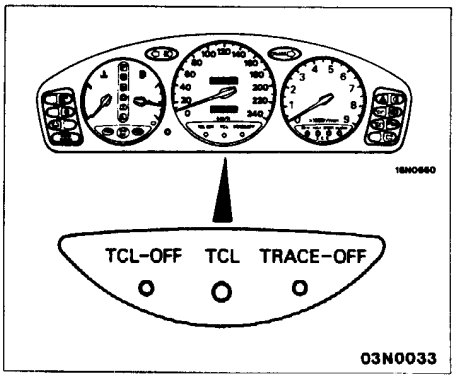
3. DIAGNOSIS FLOW CHART I

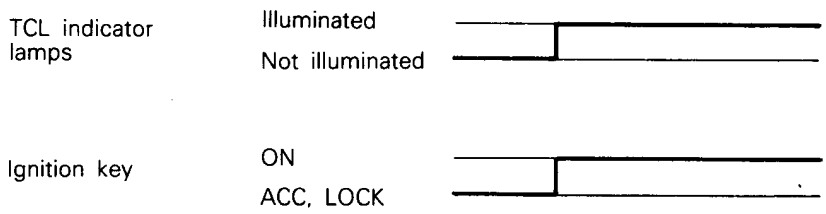
1. When the ignition key is turned to "ON", the TCL indicator does not illuminate.
2. The TCL OFF indicator remains illuminated or flashes after the engine is started or while driving.

Comment: 1. is mainly caused by a broken wire in the indicator circuit, such as an indicator lamp blowout.
2. When lamp remains illuminated, a problem is detected by the self diagnosis function and a problem code is output, or it is probably a short in the indicator circuit. If the lamp is flashing, a problem code is output, so this should be checked. When not actually driving the problem may not be detected, so it is necessary to retest to get an accurate perception of the problem.

Use the following procedures to recheck the problem.

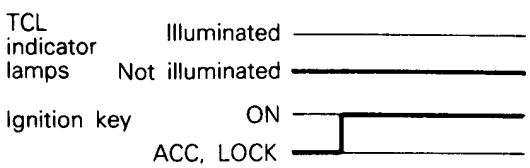
When the ignition key has been turned to the "ON" position, do all of the TCL indicators illuminate?





Yes

No

No.	Problem	Main cause	Remedy
1	All TCL indicators are not illuminated. 	Broken wire in indicator lamp power circuit (including blown fuse).	Inspect according to Inspection Chart A (P.13-18-14).
		Control unit connector is disconnected.	
2	Either the TCL OFF, TCL or the TRACE OFF indicator is not illuminated. (At least one is illuminated.)	Blown lamp in the indicator that is not illuminated.	Inspect according to Inspection Chart B (P.13-18-15).
		Broken harness wire in the indicator drive circuit of the indicator that is not illuminated.	
		Broken wire in the ECU drive circuit of the indicator that is not illuminated.	

To next page

From previous page

When engine has been started, do all of the TCL indicators switch off?

Yes

No

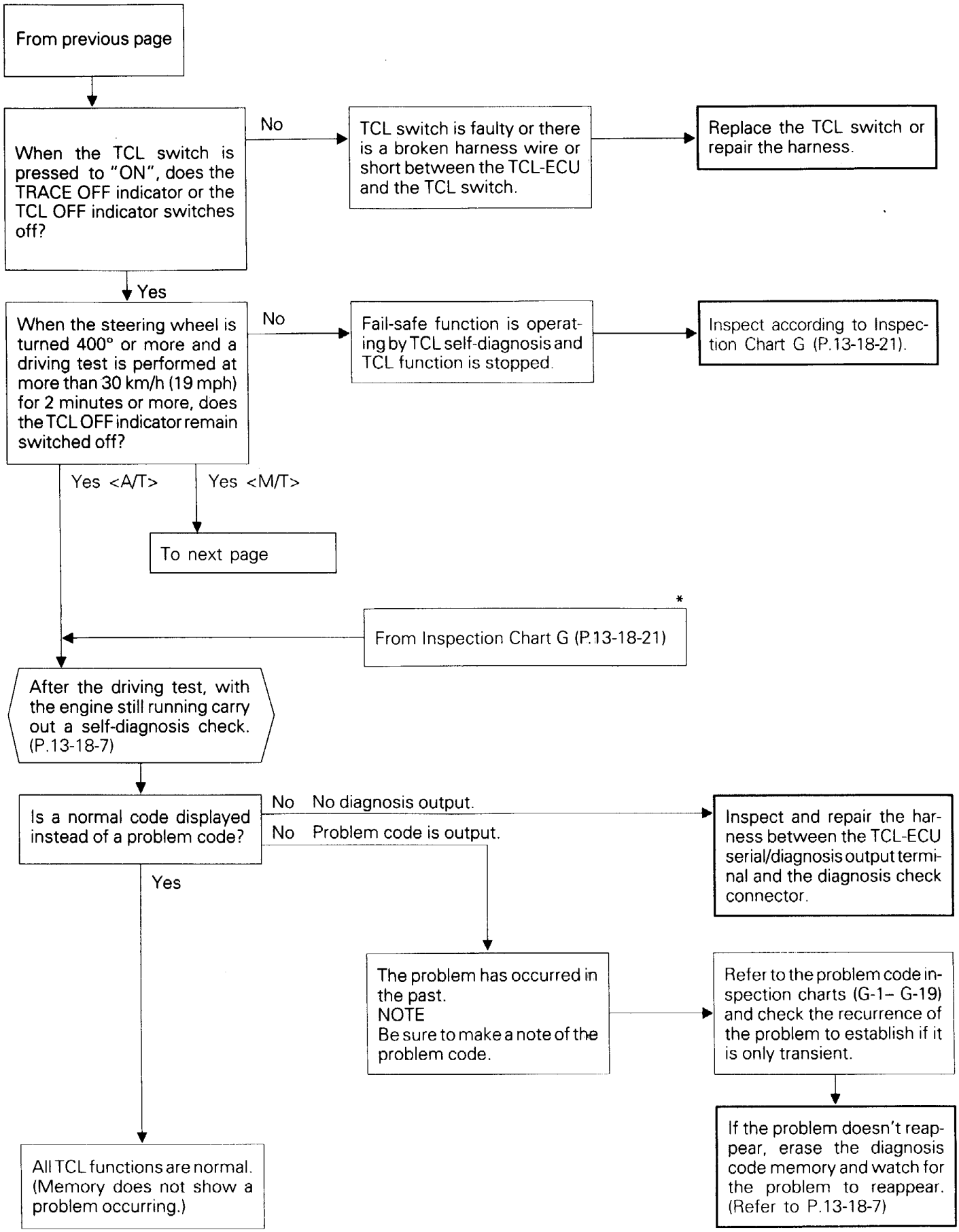
No.	Problem	Main cause	Remedy
3	The TCL OFF indicator remains illuminated	Broken wire in the ECU power circuit	Inspect according to Inspection Chart C (P.13-18-17).
		Low ECU power voltage	
		ABS-related failure.	
		Engine-related failure.	
4	The TCL OFF indicator flashes	Fail-safe function is operating by TCL self-diagnosis.	Inspect according to Inspection Chart D (P.13-18-18).
5	The TCL indicator remains illuminated.	Short in the harness of the TCL indicator drive circuit.	Inspect according to Inspection Chart E (P13-18-19).
		Short in the TCL indicator ECU drive circuit.	

When engine is idling, each time the TCL switch is pressed to "OFF", do the TRACE OFF indicator and the TCL OFF indicator alternate?

No → TCL switch or TCL-ECU is faulty. → Inspect according to Inspection Chart F (P.13-18-20)

Yes

To next page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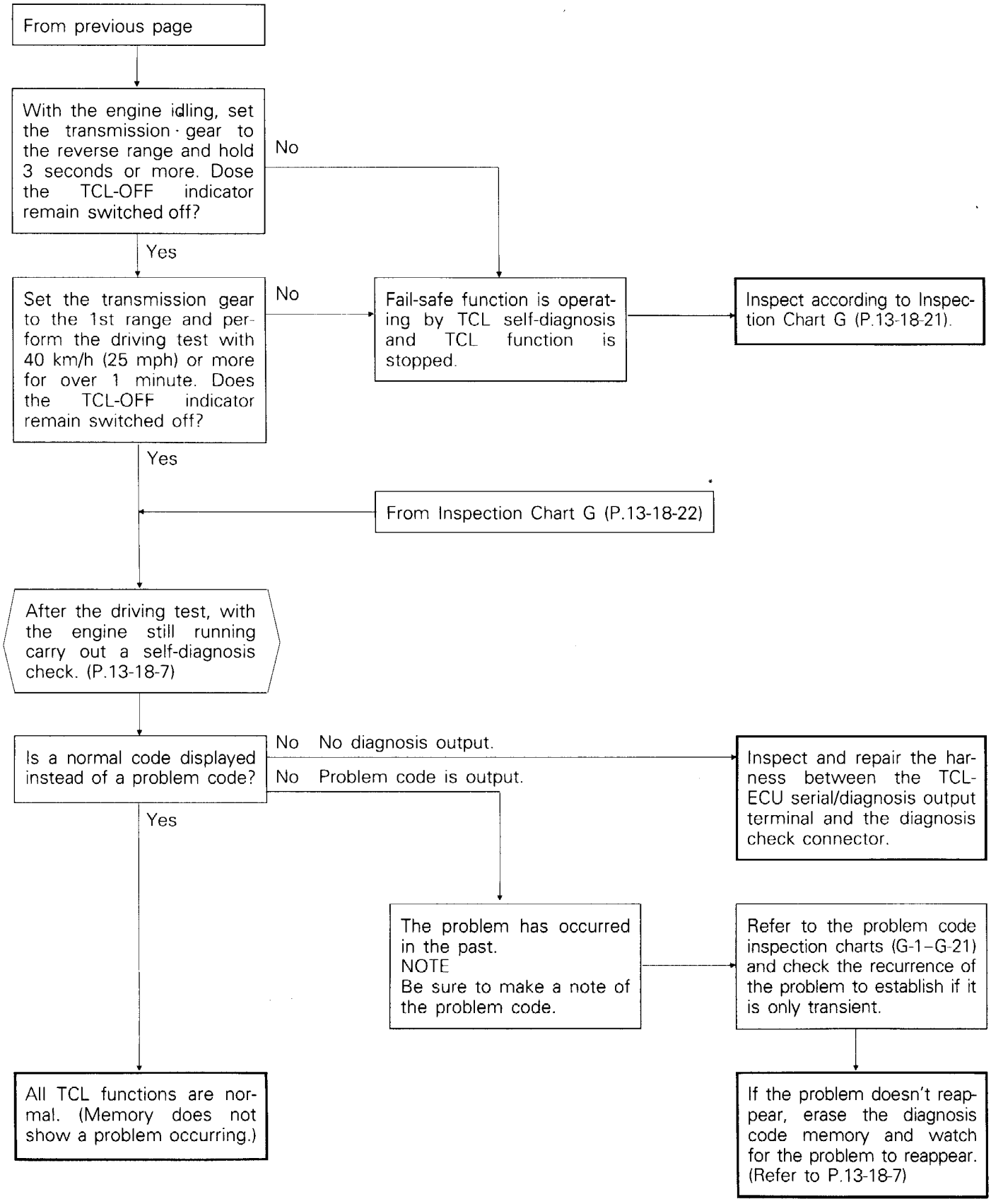
When the TCL switch is pressed to "ON", does the TRACE OFF indicator or the TCL OFF indicator switches off?
No
TCL switch is faulty or there is a broken harness wire or short between the TCL-ECU and the TCL switch.
Replace the TCL switch or repair the harness.
Yes
When the steering wheel is turned 400° or more and a driving test is performed at more than 30 km/h (19 mph) for 2 minutes or more, does the TCL OFF indicator remain switched off?
No
Fail-safe function is operating by TCL self-diagnosis and TCL function is stopped.
Inspect according to Inspection Chart G (P.13-18-21).
Yes <A/T>
Yes <M/T>
To next page
*
From Inspection Chart G (P.13-18-21)
After the driving test, with the engine still running carry out a self-diagnosis check. (P.13-18-7)
Is a normal code displayed instead of a problem code?
No No diagnosis output.
No Problem code is output.
Inspect and repair the harness between the TCL-ECU serial/diagnosis output terminal and the diagnosis check connector.
Yes
The problem has occurred in the past.
NOTE
Be sure to make a note of the problem code.
Refer to the problem code inspection charts (G-1– G-19) and check the recurrence of the problem to establish if it is only transient.
If the problem doesn't reappear, erase the diagnosis code memory and watch for the problem to reappear. (Refer to P.13-18-7)
All TCL functions are normal. (Memory does not show a problem occurring.)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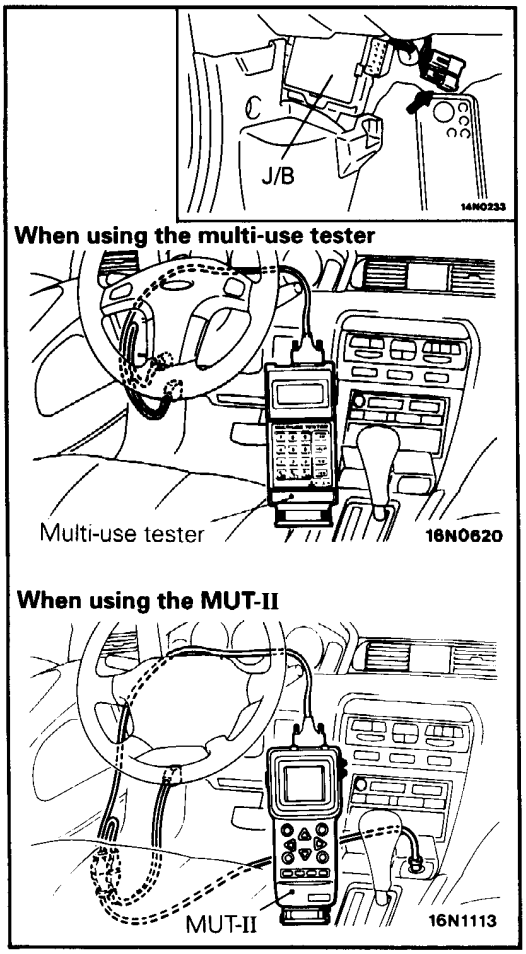
With the engine idling, set the transmission gear to the reverse range and hold 3 seconds or more. Dose the TCL-OFF indicator remain switched off?
No
Yes
Set the transmission gear to the 1st range and perform the driving test with 40 km/h (25 mph) or more for over 1 minute. Does the TCL-OFF indicator remain switched off?
No
Fail-safe function is operating by TCL self-diagnosis and TCL function is stopped.
Inspect according to Inspection Chart G (P.13-18-21).
Yes
From Inspection Chart G (P.13-18-22)
After the driving test, with the engine still running carry out a self-diagnosis check. (P.13-18-7)
Is a normal code displayed instead of a problem code?
No No diagnosis output.
No Problem code is output.
Inspect and repair the harness between the TCL-ECU serial/diagnosis output terminal and the diagnosis check connector.
Yes
The problem has occurred in the past.
NOTE
Be sure to make a note of the problem code.
Refer to the problem code inspection charts (G-1–G-21) and check the recurrence of the problem to establish if it is only transient.
All TCL functions are normal. (Memory does not show a problem occurring.)
If the problem doesn't reappear, erase the diagnosis code memory and watch for the problem to reappear. (Refer to P.13-18-7)



3-1. Inspection by self-diagnosis

Caution
Connection and disconnection of the multi-use tester <Up to 1993 models> or MUT-II <All models> should always be made with the ignition switch in the OFF position.

(1) Take a reading of the diagnosis output code and make a note of it.
If the multi-use tester or MUT-II will not activate, inspect the TCL-ECU power circuit or the harness between the TCL-ECU and the diagnosis check connector.

(2) Momentarily erase the diagnosis code memory with the multi-use tester or MUT-II. Even when the memory is erased, and a problem signal is output, the problem signal currently being displayed will also cause the function to stop. If no signal is output, the problem was only transient, or it is a problem that is only detected while driving.

(3) When a problem code is output again, or another code is output during a repeated driving test, inspect by following the diagnosis code table on the following page.

NOTE
The codes in the table below will be output as diagnosis codes for the vehicle's condition, even when the TCL system is normal.
These codes are output only when there is some problem, and when the vehicle condition returns to normal, the code will be normal.

<A/T>

Code No.	Vehicle condition
16	Battery is dead
62	ABS warning lamp is illuminated
63	ABS warning lamp is illuminated

<M/T>

Code No.	Vehicle condition
27	Battery is dead
67	ABS warning lamp is illuminated
76	ABS warning lamp is illuminated

3-2. Diagnosis code table

<A/T>

Diagnosis code No.	Probable cause	Inspection chart name or remedy	Reference page
11*1	Abnormal APS output	G-1	P.13-18-22
12*1	Broken signal wire in the shift control solenoid valve A	G-2	P.13-18-25
13*1	Broken signal wire in the shift control solenoid valve B		
14*1	Malfunction of the APS or TPS	G-3	P.13-18-27
15*1	Malfunction of the TCL switch	G-4	P.13-18-27
16*2	Drop in ECU power voltage	G-5	P.13-18-28
17*2	Broken signal wire in IG2	G-6	P.13-18-30
21*1	Broken wire in the front left wheel speed sensor	G-7	P.13-18-31
22*1	Broken wire in the front right wheel speed sensor		
23*1	Broken wire in the rear left wheel speed sensor		
24*1	Broken wire in the rear right wheel speed sensor		
25*4	Temporary simultaneous malfunction of the rear left and right wheel speed sensors	G-8	P.13-18-33
26*1	Simultaneous malfunction in the rear left and right wheel speed sensors	G-9	P.13-18-33
33*1	Broken wire in the steering wheel sensor	G-10	P.13-18-34
34*1	Malfunction of the steering wheel sensor ST-1 or ST-2	G-11	P.13-18-36
35*1	Malfunction of the steering wheel sensor ST-N	G-12	P.13-18-37
41*1	Abnormal signal flow to the engine-ECU	G-13	P.13-18-39

Diagnosis code No.	Probable cause	Inspection chart name or remedy	Reference page
42*3	Malfunction of the engine-ECU throttle system	Inspect according to Engine Troubleshooting	—
43*3	CHECK ENGINE warning lamp is illuminated		
51*1	No drive signal response from the front right brake solenoid valve IN side	G-14	P.13-18-40
52*1	No drive signal response from the front right brake solenoid valve EX side		
53*1	No drive signal response from the front left brake solenoid valve IN side		
54*1	No drive signal response from the front left brake solenoid valve EX side		
55*1	Malfunction of the brake solenoid valve relay	G-15	P.13-18-42
56*3	Malfunction of the brake solenoid valve IN side	G-16	P.13-18-44
61*1	Broken wire in the ABS 0 (ABS operating) signal	G-17	P.13-18-44
62*2	Broken wire in the ABS 1 (ABS fail) signal, or malfunction of the ABS	G-18	P.13-18-45
63*2	Broken wire in the ABS 0 and the ABS 1 simultaneously, or malfunction in the ABS-ECU	G-19	P.13-18-45
—	Normal	—	—

NOTE
(1) When the above problem codes are output, the TCL OFF indicator gives the following displays from the TCL-ECU.
*1: Causes the indicator to flash.
*2: Causes the indicator to illuminate. However, if the system becomes normal, this problem code is automatically erased, and the TCL OFF indicator switches off.
*3: Causes the indicator to illuminate.
*4: This signal is judged to be only temporary, and the TCL OFF indicator is not illuminated or made to flash. (If the system becomes normal, the problem code is automatically erased.)
(2) When several problems are detected, they are all displayed, starting from the lowest code number.

<M/T>

Diagnosis code No.	Probable cause	Inspection chart name or remedy	Reference page
11*1	Abnormal APS output	G-1	P.13-18-22
14*1	Malfunction of the APS or TPS	G-3	P.13-18-27
24*1	Malfunction of the TCL switch	G-4	P.13-18-27
26*2	Broken signal wire in IG2	G-6	P.13-18-30
27*2	Drop in ECU power voltage	G-5	P.13-18-28
31*1	Broken wire in the front right wheel speed sensor	G-7	P.13-18-31
32*1	Broken wire in the front left wheel speed sensor		
33*1	Broken wire in the rear right wheel speed sensor		
34*1	Broken wire in the rear left wheel speed sensor		
35*4	Temporary simultaneous malfunction of the rear left and right wheel speed sensors	G-8	P.13-18-33
36*1	Simultaneous malfunction in the rear left and right wheel speed sensors	G-9	P.13-18-33
44*1	Malfunction of the steering wheel sensor ST-1 or ST-2	G-11	P.13-18-36
45*1	Malfunction of the steering wheel sensor ST-N	G-12	P.13-18-37
47*1	Broken wire in the steering wheel sensor	G-10	P.13-18-34
54*1	Malfunction of the first detection switch	G-20	P.13-18-46
55*1	Malfunction of the first detection switch or back-up lamp switch	G-21	P.13-18-47

Diagnosis code No.	Probable cause	Inspection chart name or remedy	Reference page
61*1	No drive signal response from the front right brake solenoid valve IN side	G-14	P.13-18-40
62*1	No drive signal response from the front right brake solenoid valve EX side		
63*1	No drive signal response from the front left brake solenoid valve IN side		
64*1	No drive signal response from the front left brake solenoid valve EX side		
65*1	Malfunction of the brake solenoid valve relay	G-15	P.13-18-42
66*3	Malfunction of the brake solenoid valve IN side	G-16	P.13-18-44
67*2	Broken wire in the ABS 0 (ABS operating) signal and the ABS 1 (ABS fail) signal simultaneously, or malfunction in the ABS-ECU	G-19	P.13-18-45
71*1	Abnormal signal flow to the engine-ECU	G-13	P.13-18-39
72*3	CHECK ENGINE warning lamp is illuminated	Inspect according to Engine Troubleshooting	—
73*3	Malfunction of the engine-ECU throttle system		
76*2	Broken wire in the ABS 1 (ABS fail) signal, or malfunction of the ABS	G-18	P.13-18-45
77*1	Broken wire in the ABS 0 (ABS operating) signal	G-17	P.13-18-44
—	Normal	—	—

NOTE
(1) When the above problem codes are output, the TCL OFF indicator gives the following displays from the TCL-ECU.
*1: Causes the indicator to flash.
*2: Causes the indicator to illuminate. However, if the system becomes normal, this problem code is automatically erased, and the TCL OFF indicator switches off.
*3: Causes the indicator to illuminate.
*4: This signal is judged to be only temporary, and the TCL OFF indicator is not illuminated or made to flash. (If the system becomes normal, the problem code is automatically erased.)
(2) When several problems are detected, they are all displayed, starting from the lowest code number.

3-3. Table of service data inspection items

The following items from the ECU input data can be read using the multi-use tester.

<A/T>

Service data items		Display units	Service data items		Display units
No.	Item		No.	Item	
11	APS opening	mV	24	Wheel speed of rear right wheel	km/H
12	SCSV A drive	ON/OFF	27	Engine displacement	2.5L/3.0L
13	SCSV B drive	ON/OFF	28	Inhibitor switch input	2, L, D, R/N, P
14	TPS opening	mV			
15	Inhibitor switch R position input	ON/OFF	29	Slip control	ON/OFF
16	ECU power voltage	V	30	Trace control	ON/OFF
17	TCL OFF switch input	ON/OFF	31	Steering angle	deg
18	TCL ON switch input	ON/OFF	32	Steering neutral point	ON/OFF
19	Idle switch input	ON/OFF	33	Steering neutral point memory	ON/OFF
20	Ignition switch input	ON/OFF	34	Solenoid RH drive (Intake)	ON/OFF
21	Wheel speed of front left wheel	km/H	35	Solenoid RH drive (Exhaust)	ON/OFF
22	Wheel speed of front right wheel	km/H	36	Solenoid LH drive (Intake)	ON/OFF
23	Wheel speed of rear left wheel	km/H	37	Solenoid LH drive (Exhaust)	ON/OFF

NOTE

1. For the steering angle (Item No. 31) 0° will be displayed for neutral position (before memory setting of the neutral position, the ignition key is turned to "ON"), L for left-hand side and R for right-hand side.
2. For steering neutral point memory (Item No. 33), when the memory setting of the steering neutral position is completed, "ON" will be displayed.

<M/T>

Service data items		Display units
No.	Item	
11	APS opening	mV
13	TPS opening	mV
16	Back-up lamp switch input	ON/OFF
21	Idle switch input	ON/OFF
22	Ignition switch input	ON/OFF
24	TCL ON switch input	ON/OFF
25	TCL OFF switch input	ON/OFF
27	ECU power voltage	V
29	Engine displacement	2.5L/3.0L
31	Wheel speed of front right wheel	km/H
32	Wheel speed of front left wheel	km/H
33	Wheel speed of rear right wheel	km/H

Service data items		Display units
No.	Item	
34	Wheel speed of rear left wheel	km/H
43	Steering neutral point	ON/OFF
44	Steering angle	deg
45	Steering neutral point memory	ON/OFF
51	Slip control	ON/OFF
52	Trace control	ON/OFF
54	First detection switch input	ON/OFF
56	Distinction between TCL-ECU for 2WS and that for 4WS	2WS/4WS
61	Solenoid RH drive (Intake)	ON/OFF
62	Solenoid RH drive (Exhaust)	ON/OFF
63	Solenoid LH drive (Intake)	ON/OFF
64	Solenoid LH drive (Exhaust)	ON/OFF

NOTE

1. For the steering angle (Item No. 44) 0° will be displayed for neutral position (before memory setting of the neutral position, the ignition key is turned to "ON"), L for left-hand side and R for right-hand side.
2. For steering neutral point memory (Item No. 45), when the memory setting of the steering neutral position is completed, "ON" will be displayed.

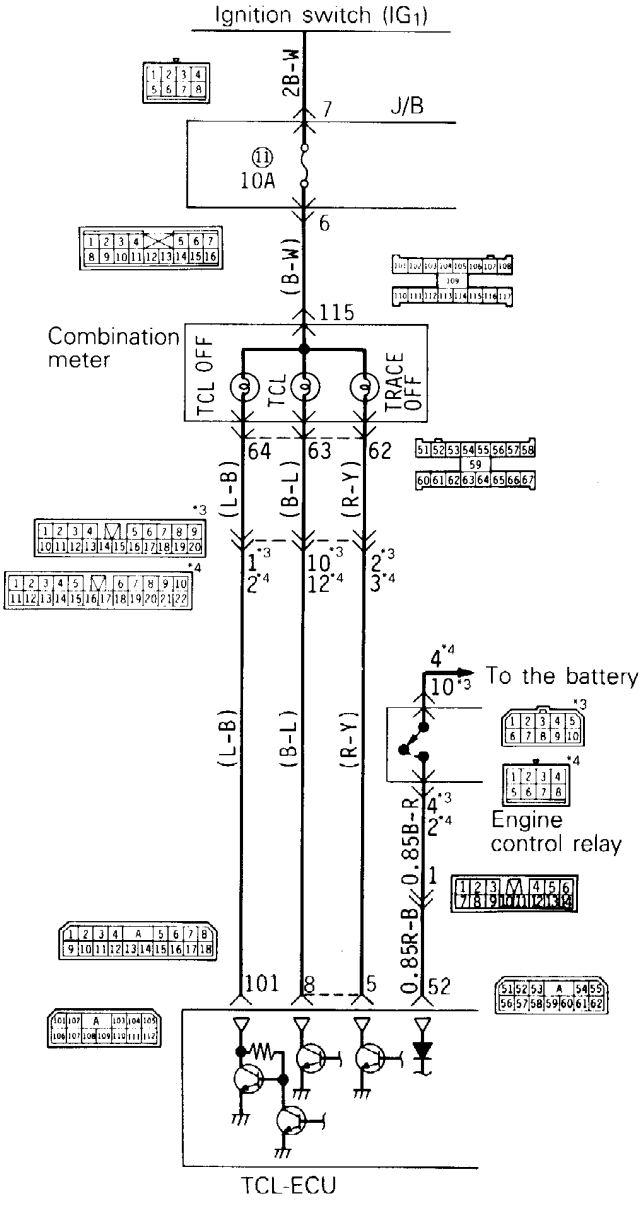
3-4. Inspection chart for each problem

A	**After the igintion key has been turned to the "ON" position, all of the TCL indicators do not illuminate.**

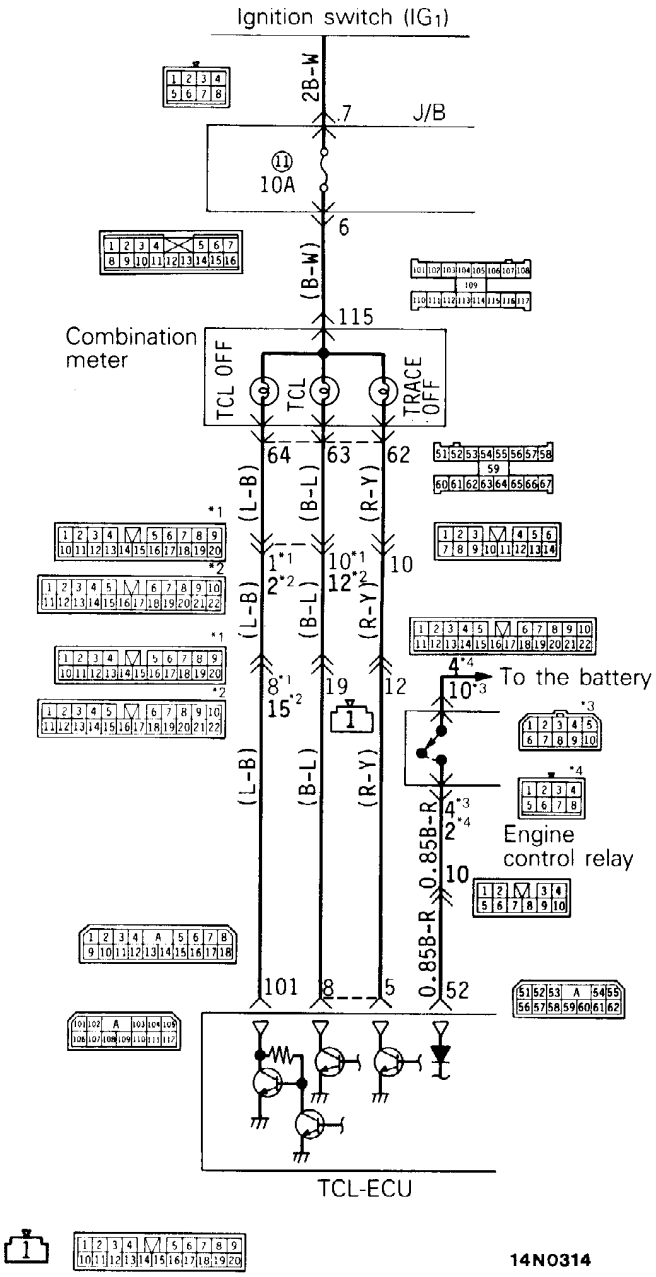
Comment: When the power has been connected, the TCL-ECU will make the TCL OFF, TCL and TRACE OFF indicators all illuminate until engine revolutions reach 450 rpm or higher, in order to check the indicator bulbs. However, the TCL OFF indicator will illuminate even when not started by the ECU. Thus, when all the indicators do not illuminate, the cause could be either a broken wire in the indicator lamp power circuit or a loose ECU connector.

Hint: If other warning lamps also do not illuminate, the problem is likely to be a blown fuse.

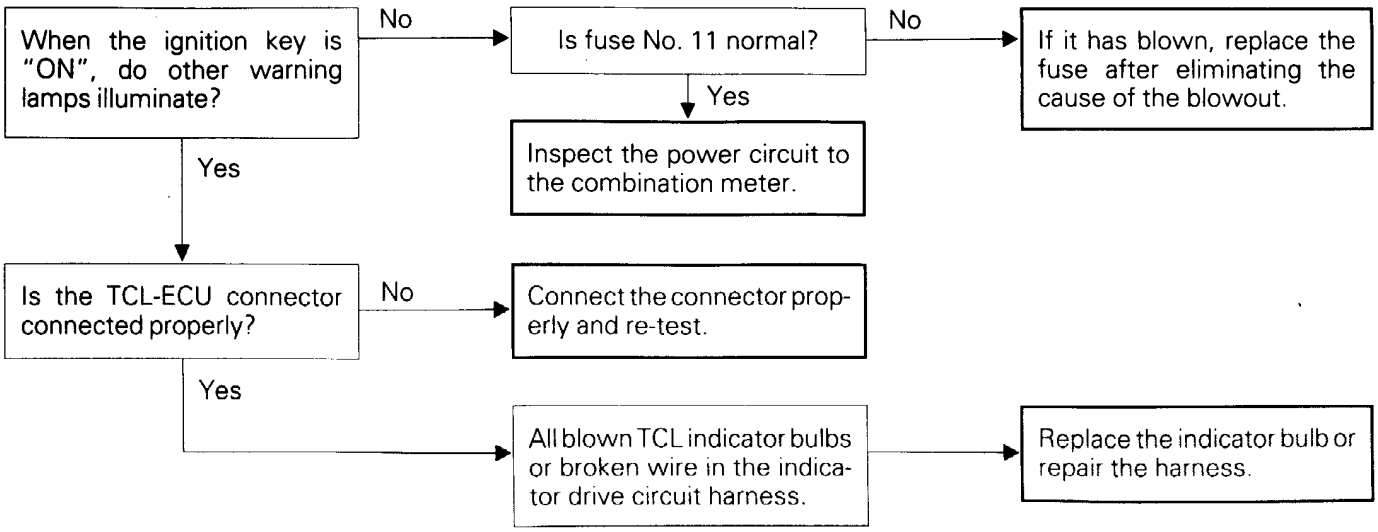
LH drive vehicles



RH drive vehicles



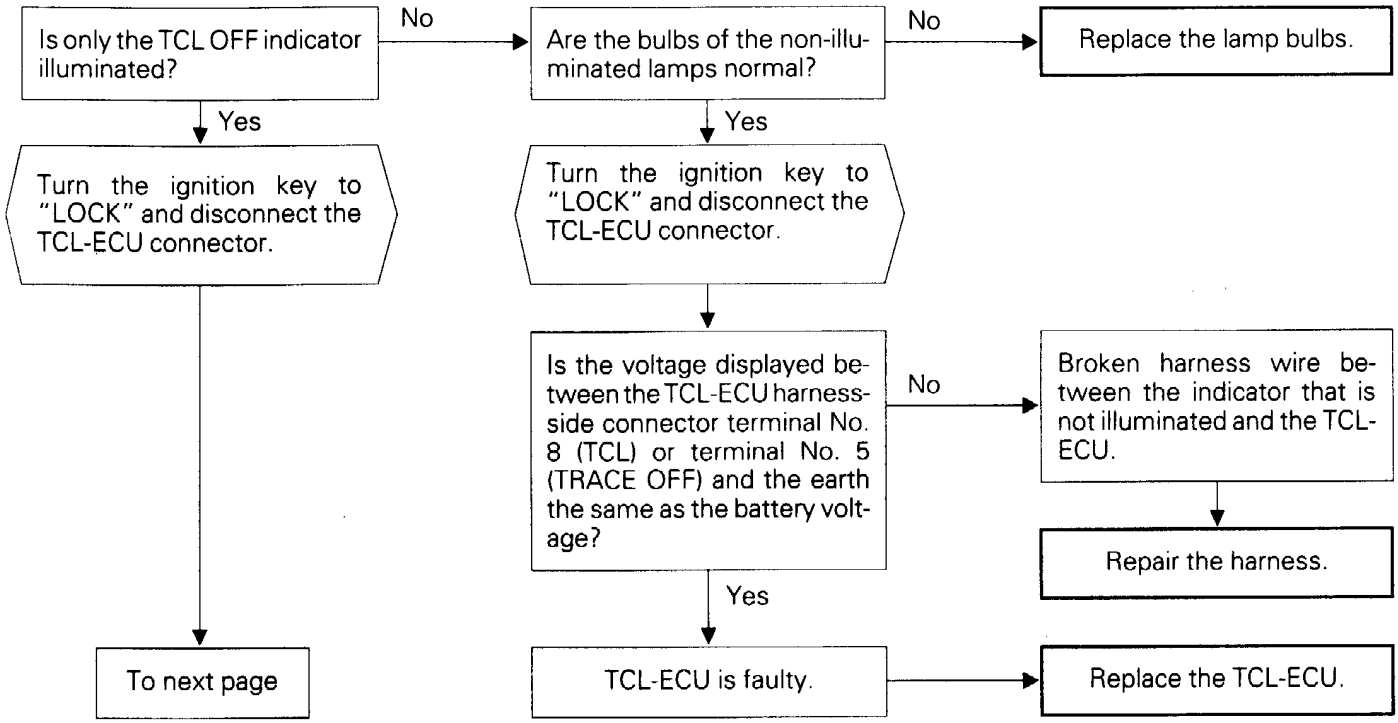
NOTE
*1: Vehicles built up to October, 1991
*2: Vehicles built from November, 1991
*3: Vehicles built up to October, 1992
*4: Vehicles built from November, 1992

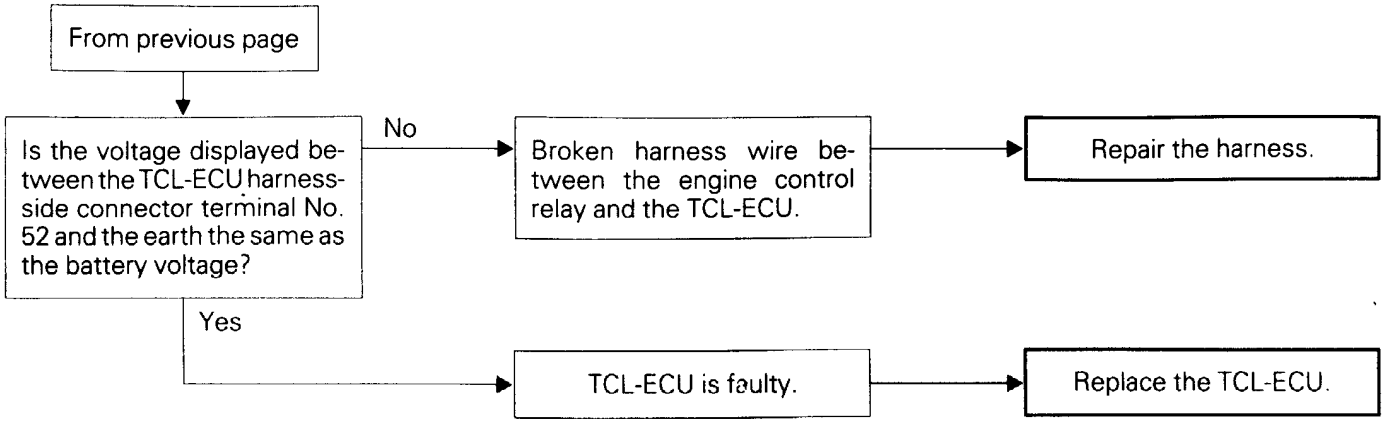


B	**When the ignition key is "ON", either the TCL OFF, TCL or TRACE OFF indicator does not illuminate. (At least one of the indicators does illuminate.)**

Comment: The TCL indicators share a common power circuit, so when one or more of the indicators illuminates, the power circuit can be diagnosed as normal. Therefore, there is a strong possibility that the problem is a bulb failure or a broken harness wire.

Hint: The TCL OFF indicator can illuminate even when its circuit is not driven by the TCL-ECU. Therefore if the TCL OFF indicator is illuminated but other indicators are not illuminated, the reason is probably a faulty TCL-ECU (broken wire in the TCL-ECU power circuit).



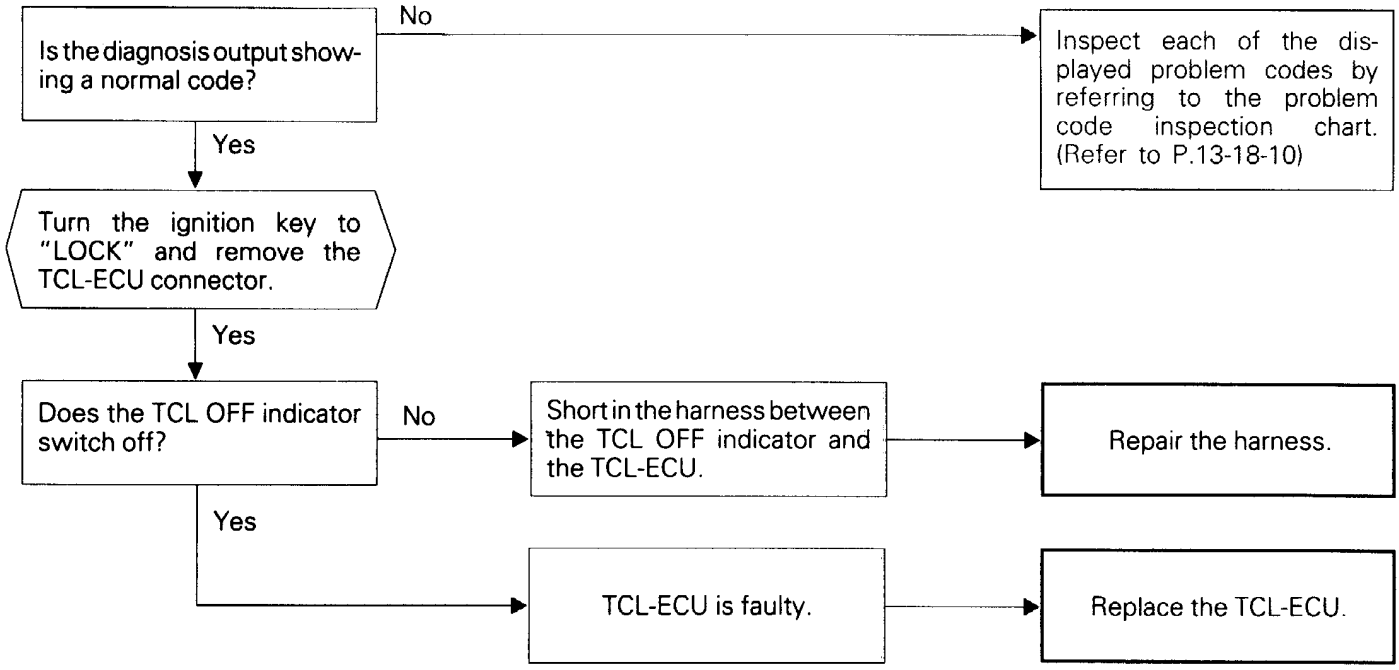

From previous page
Is the voltage displayed between the TCL-ECU harness-side connector terminal No. 52 and the earth the same as the battery voltage?
No
Broken harness wire between the engine control relay and the TCL-ECU.
Repair the harness.
Yes
TCL-ECU is faulty.
Replace the TCL-ECU.

C	**After the engine is started, the TCL OFF indicator only remains illuminated. (Other indicators switch off.)**

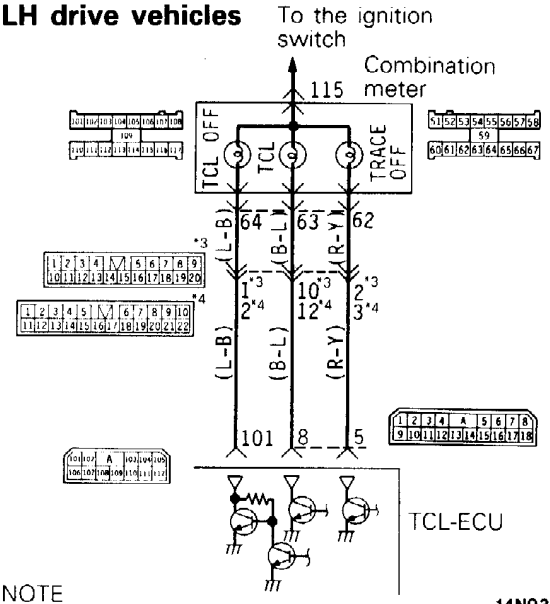
Comment: The TCL OFF indicator serves as a system warning indicator, and if the self-checking function detects a malfunction in the system immediately after starting the engine, this indicator will illuminate or flash.
When the indicator illuminates, the cause is a problem in some other system connected with the TCL, or a drop in power voltage.

Hint: When the ABS warning lamp is illuminated, it is likely that there is a problem with the ABS, and when the CHECK ENGINE lamp is illuminated, there is a problem with the engine control system.

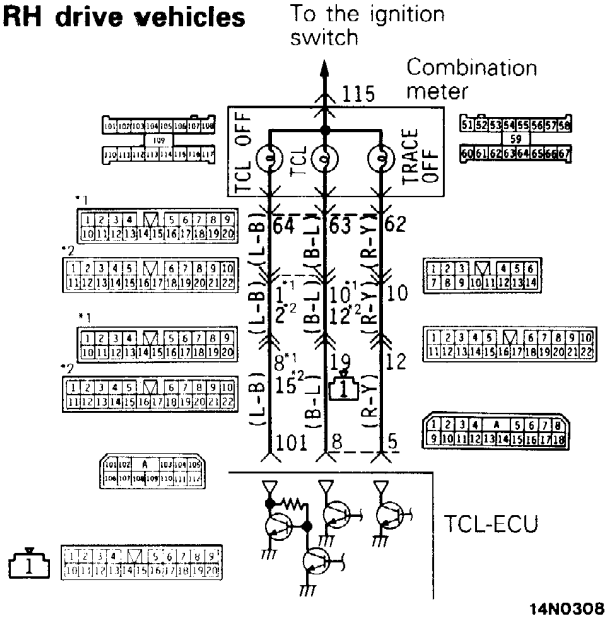
NOTE
If there is no diagnosis output (communication cannot be made with the multi-use tester), inspect and repair the harness between the ECU serial/diagnosis output terminal and the diagnosis connector.



LH drive vehicles



RH drive vehicles

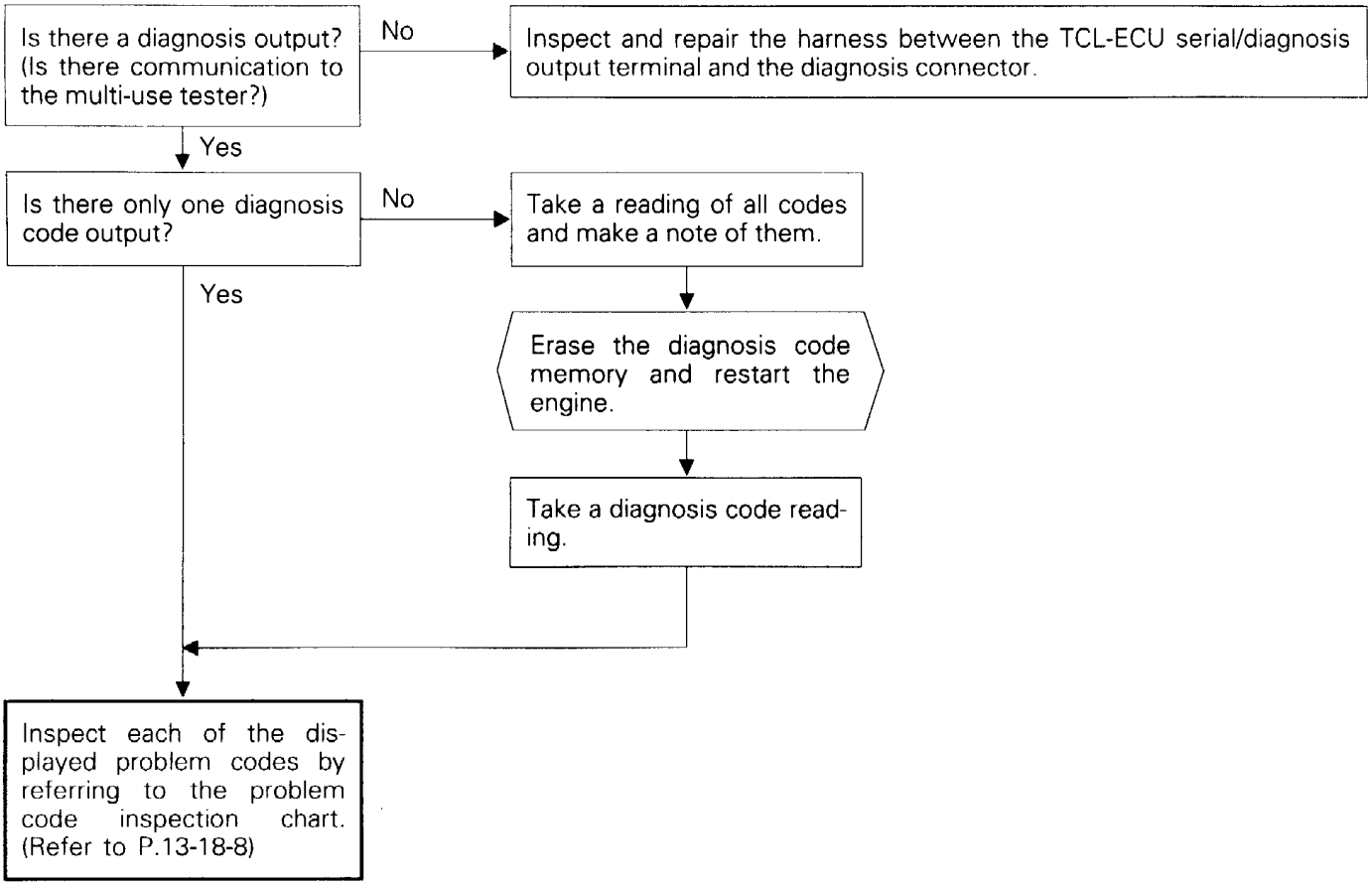


NOTE
*1: Vehicles built up to October, 1991
*2: Vehicles built from November, 1991
*3: Vehicles built up to October, 1992
*4: Vehicles built from November, 1992

D	After the engine is started, the TCL OFF indicator flashes.

Comment: The TCL OFF indicator serves as a system warning indicator, and if the self-checking function detects a malfunction in the system immediately after starting the engine, this indicator will illuminate or flash.
When the indicator flashes, it shows that a problem in the TCL-ECU has been detected, and the system functions have been stopped.

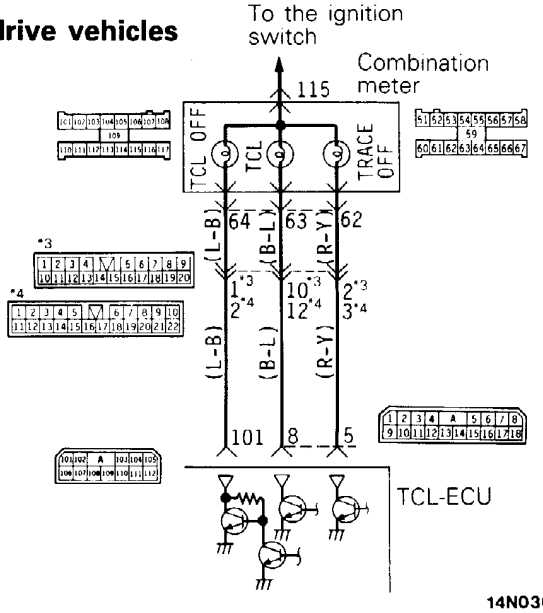
NOTE
1. When several problem codes are displayed, it is impossible to tell which code is causing the indicator to flash immediately after the engine has been turned on. When there are problems, if the diagnosis code memory is momentarily erased and the engine is restarted, those problem codes will again be displayed.
2. Furthermore, there are some problems that cannot be detected immediately after starting the engine or during idling, but only when the vehicle is actually moving. Therefore, for non-recorded codes, the problems should be checked again during driving and if they recur, the problem code inspection chart should be referred to for inspection.



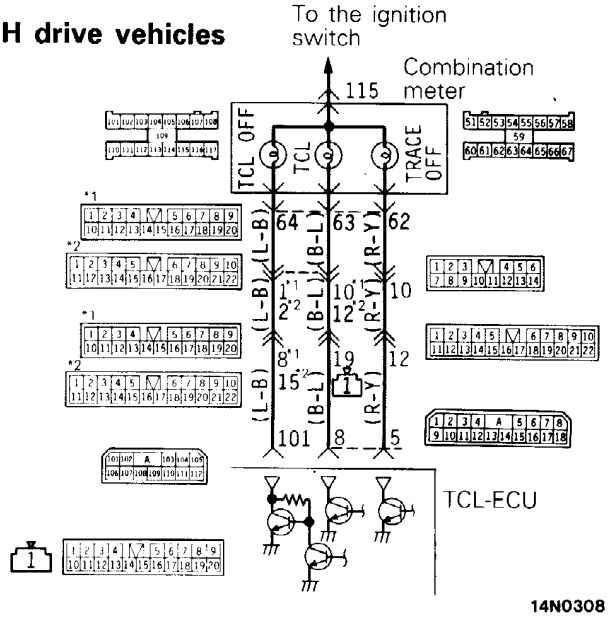
E	After the engine is started, the TCL indicator stays on.

Comment: The TCL indicator illuminates when the engine is running only when the traction control is operating. If the light stays on after the engine is started, the cause is a short in the TCL indicator drive circuit or a faulty TCL-ECU.

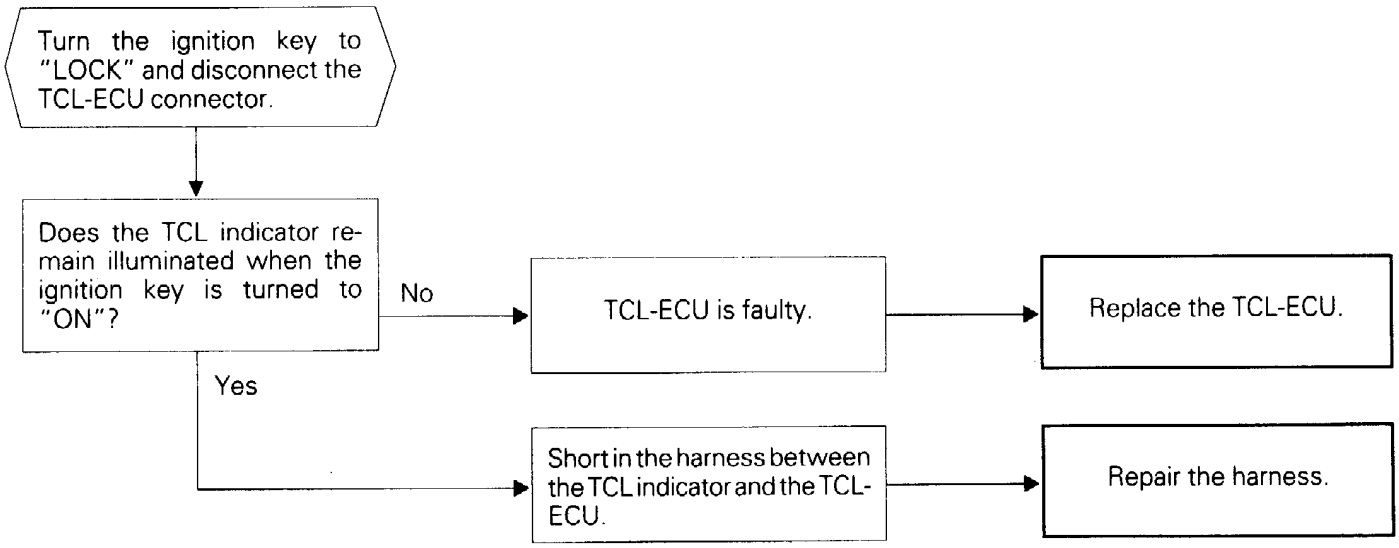
LH drive vehicles



RH drive vehicles



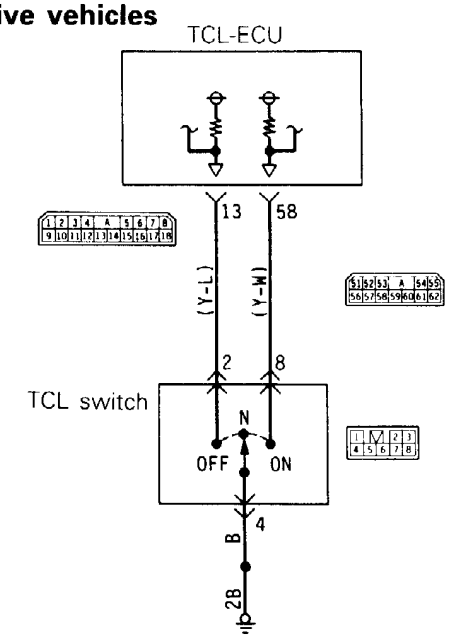
NOTE
*1: Vehicles built up to October, 1991
*2: Vehicles built from November, 1991
*3: Vehicles built up to October, 1992
*4: Vehicles built from November, 1992



F	**When the engine is idling, no matter how often the TCL switch is turned to the "OFF" position, the TRACE OFF indicator and the TCL OFF indicator do not alternate.**

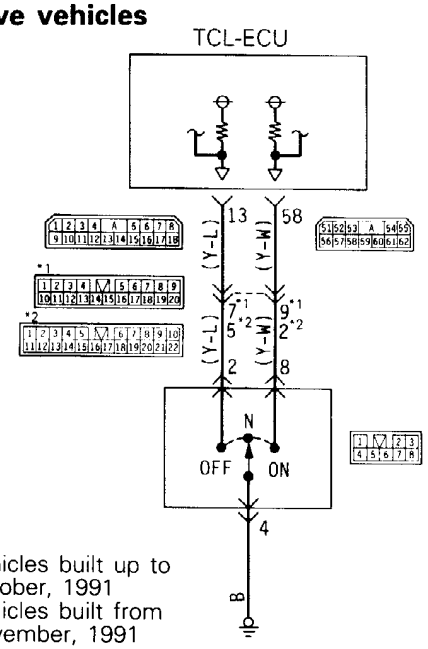
Comment: The TRACE OFF indicator and the TCL OFF indicator illuminate alternately each time the TCL switch is turned to OFF. When the indicators do not alternate when the switch is operated, there is a problem with the switch or with the TCL-ECU.

LH drive vehicles



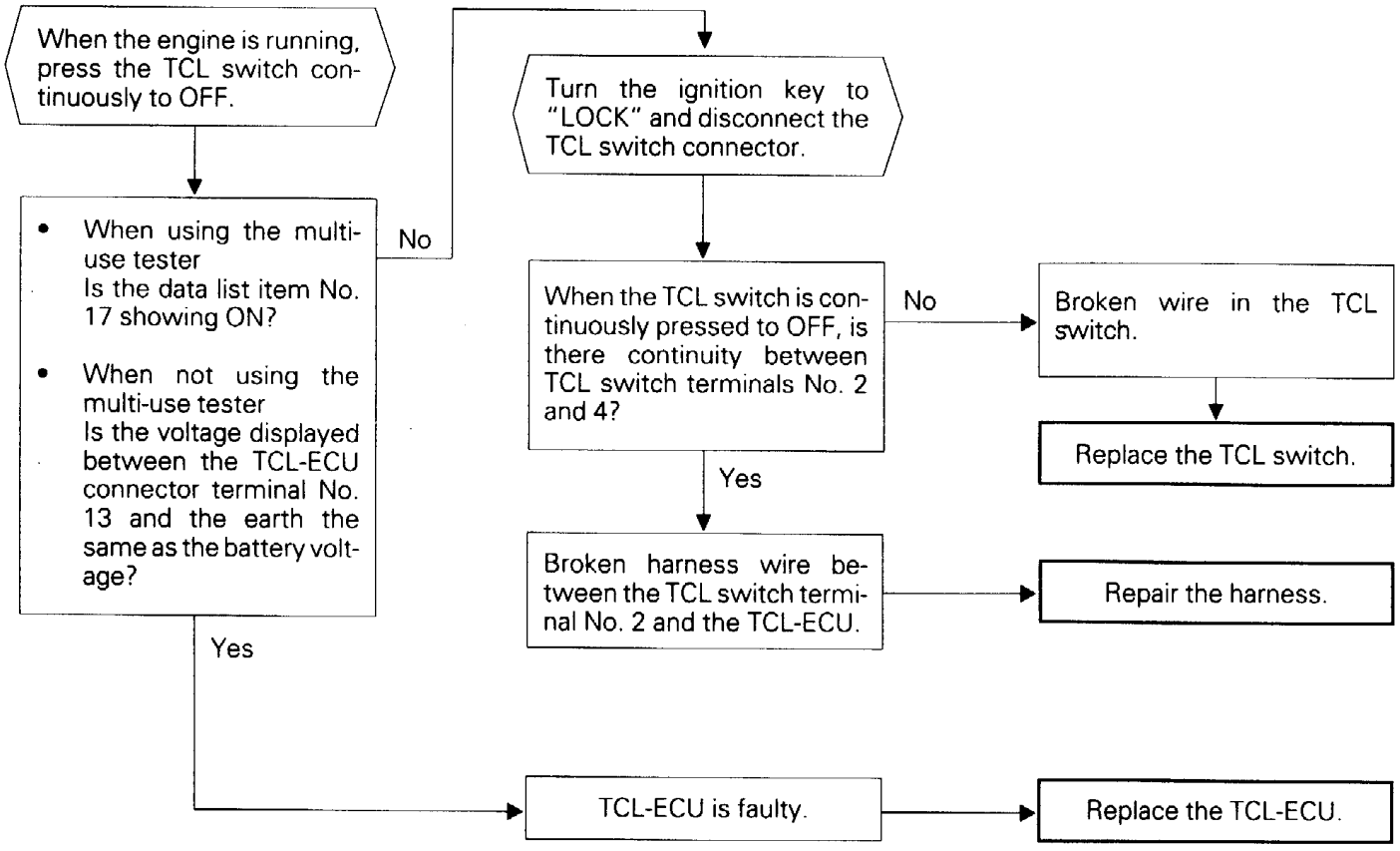
14N0239

RH drive vehicles



NOTE
*1: Vehicles built up to October, 1991
*2: Vehicles built from November, 1991

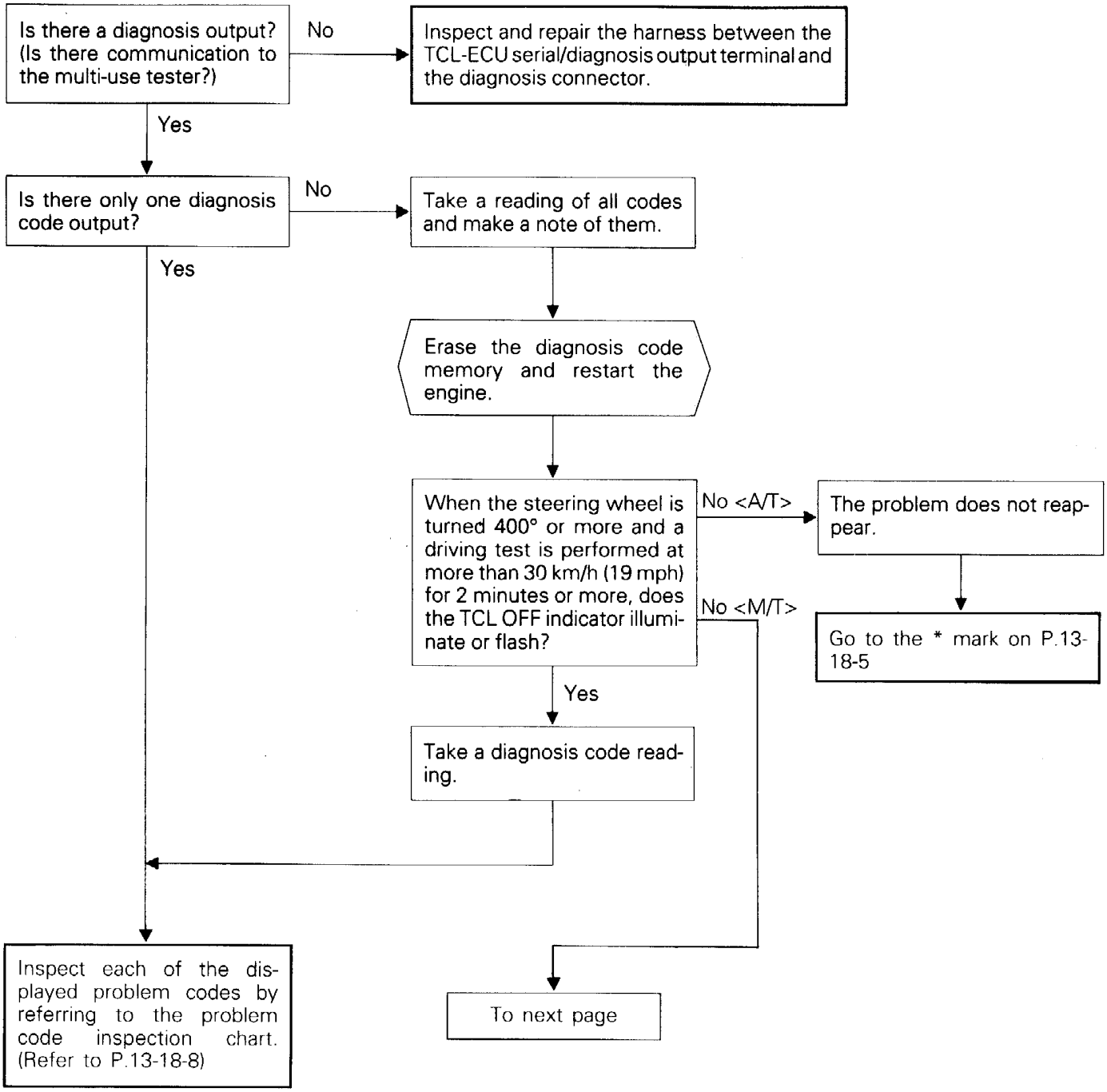
14N0306

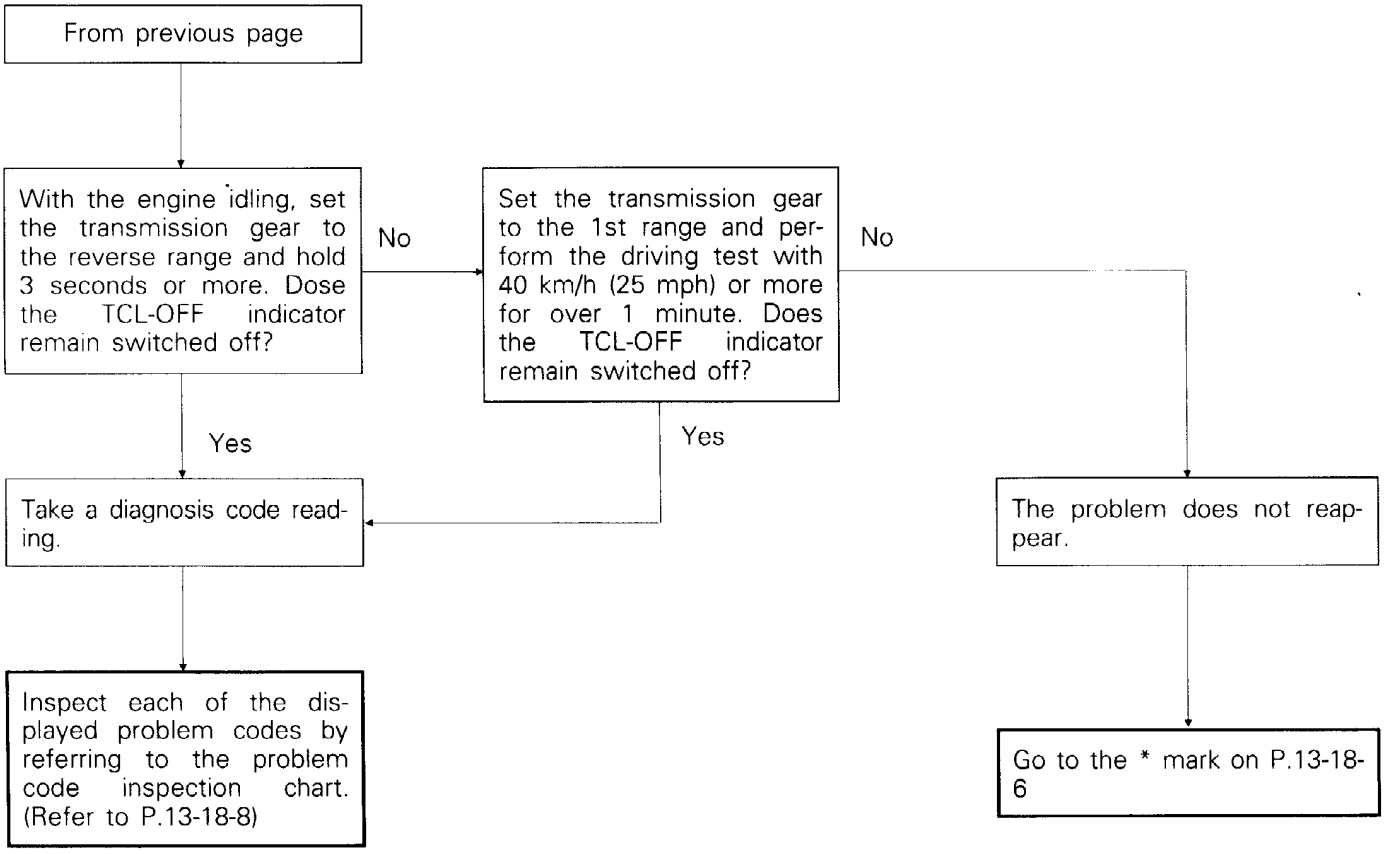


G	**The TCL OFF indicator is normal when the engine is idling, but illuminates or flashes when the vehicle is moving.**

Comment: The TCL OFF indicator serves as a system warning indicator. Even if the self-checking function shows the system to be normal immediately after starting the engine, problems that can be detected only while the vehicle is actually moving can only be checked by a driving test.

NOTE
When several problem codes are displayed, it is impossible to tell which code is causing the indicator to flash when driving. When there are problems, if the diagnosis code memory is momentarily erased and the engine is restarted, those problem codes will again be displayed.
Furthermore, for non-recorded codes, the problems should be checked again and if they recur, the problem code inspection chart should be referred to for inspection.



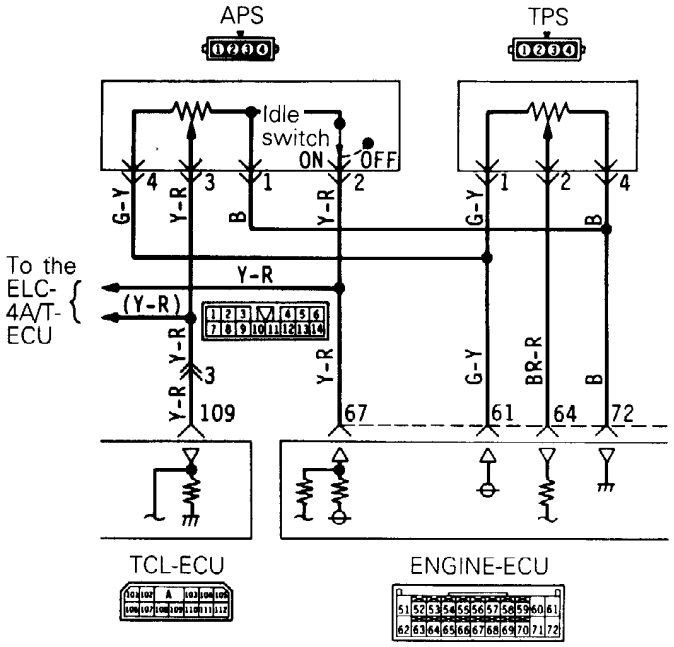


G-1 When diagnosis code No. 11 is displayed

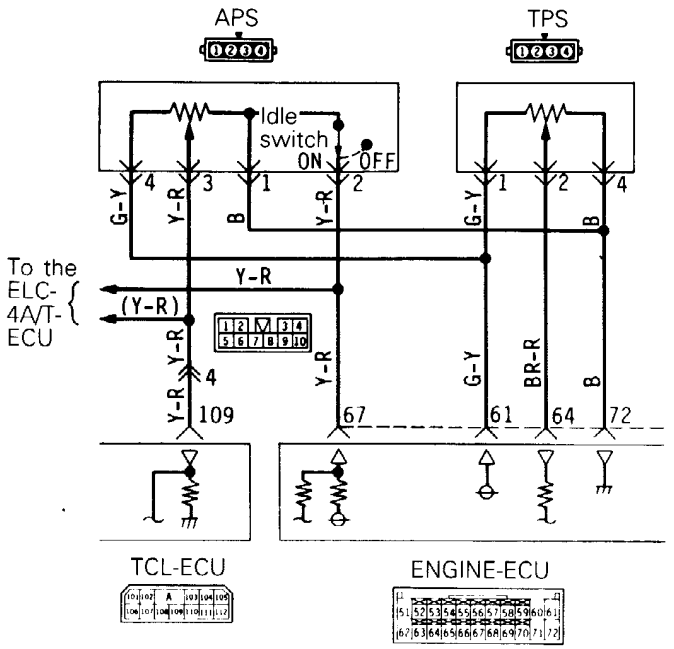
Comment: This problem code is displayed when the APS output voltage becomes less than 0.2V due to a blown or shorted APS circuit.

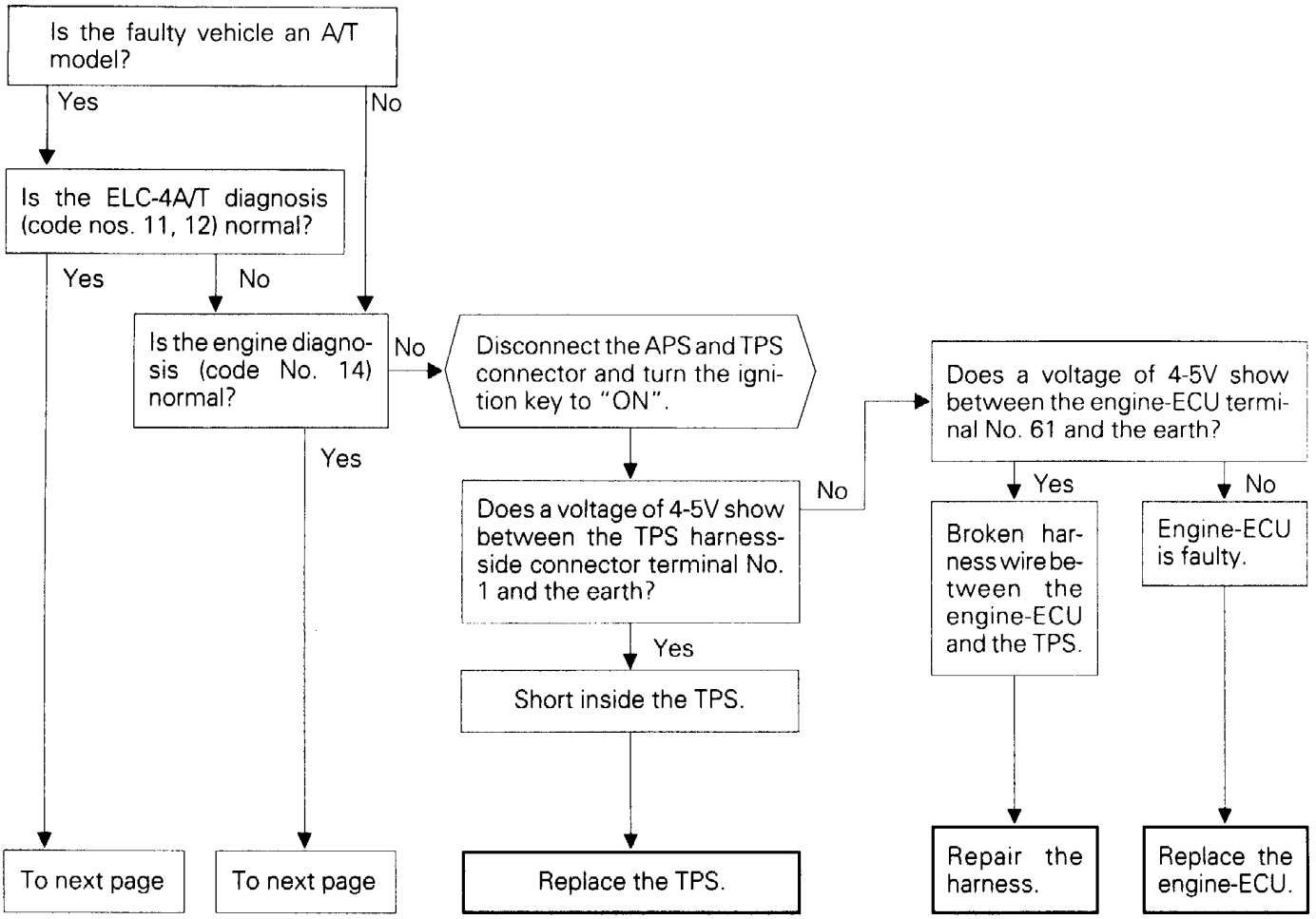
Hint: APS power is supplied from the engine-ECU, and the output signal is shared by the ELC-4A/T and the ECS (electronic controlled suspension) as well as the TCL. Therefore, for vehicles with A/T, if the ELC-4A/T diagnosis (APS diagnosis time is 4 seconds) is normal, then there is a broken harness wire between the APS and the TCL-ECU, or the TCL-ECU is faulty.

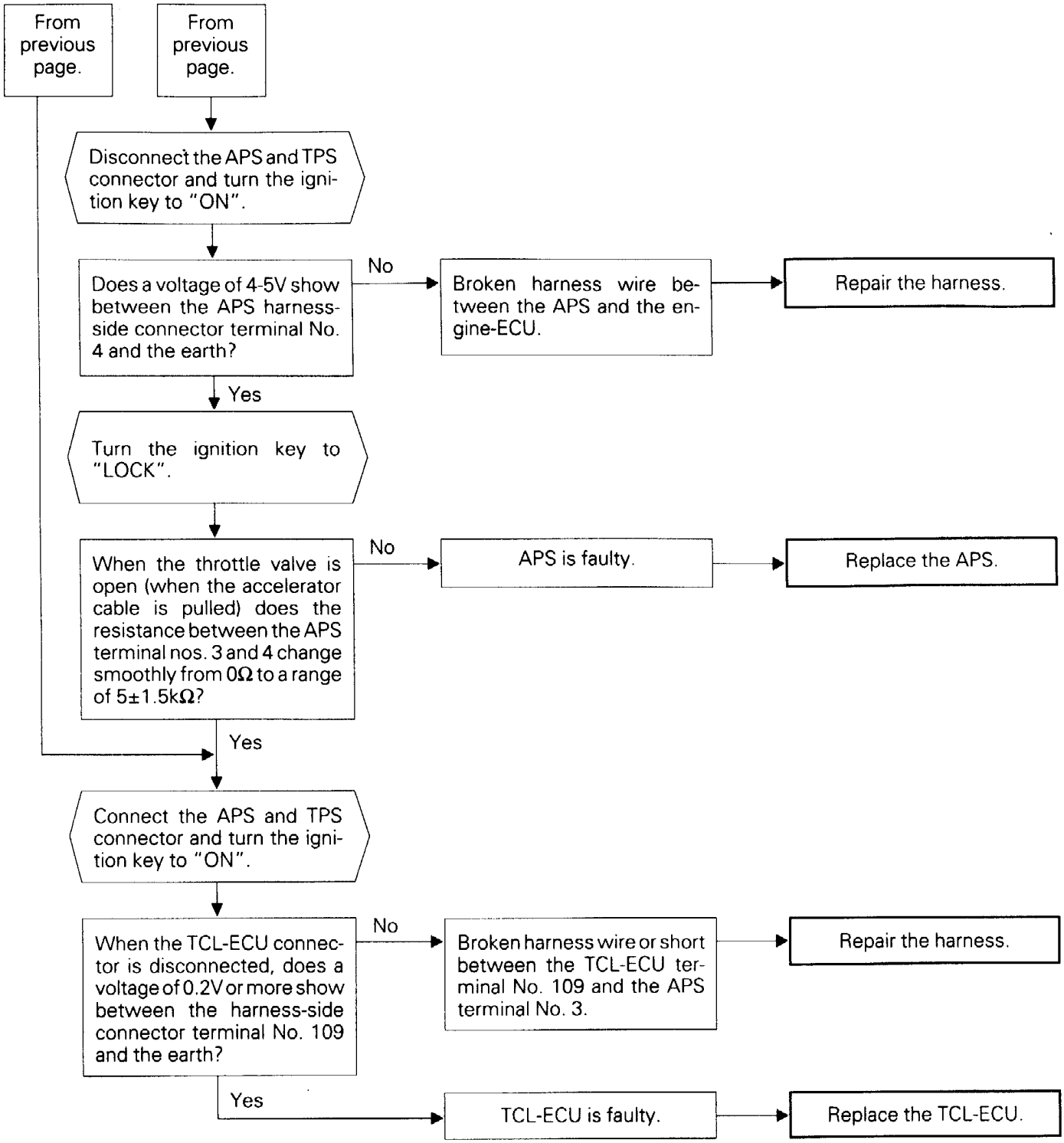
LH drive vehicles



RH drive vehicles







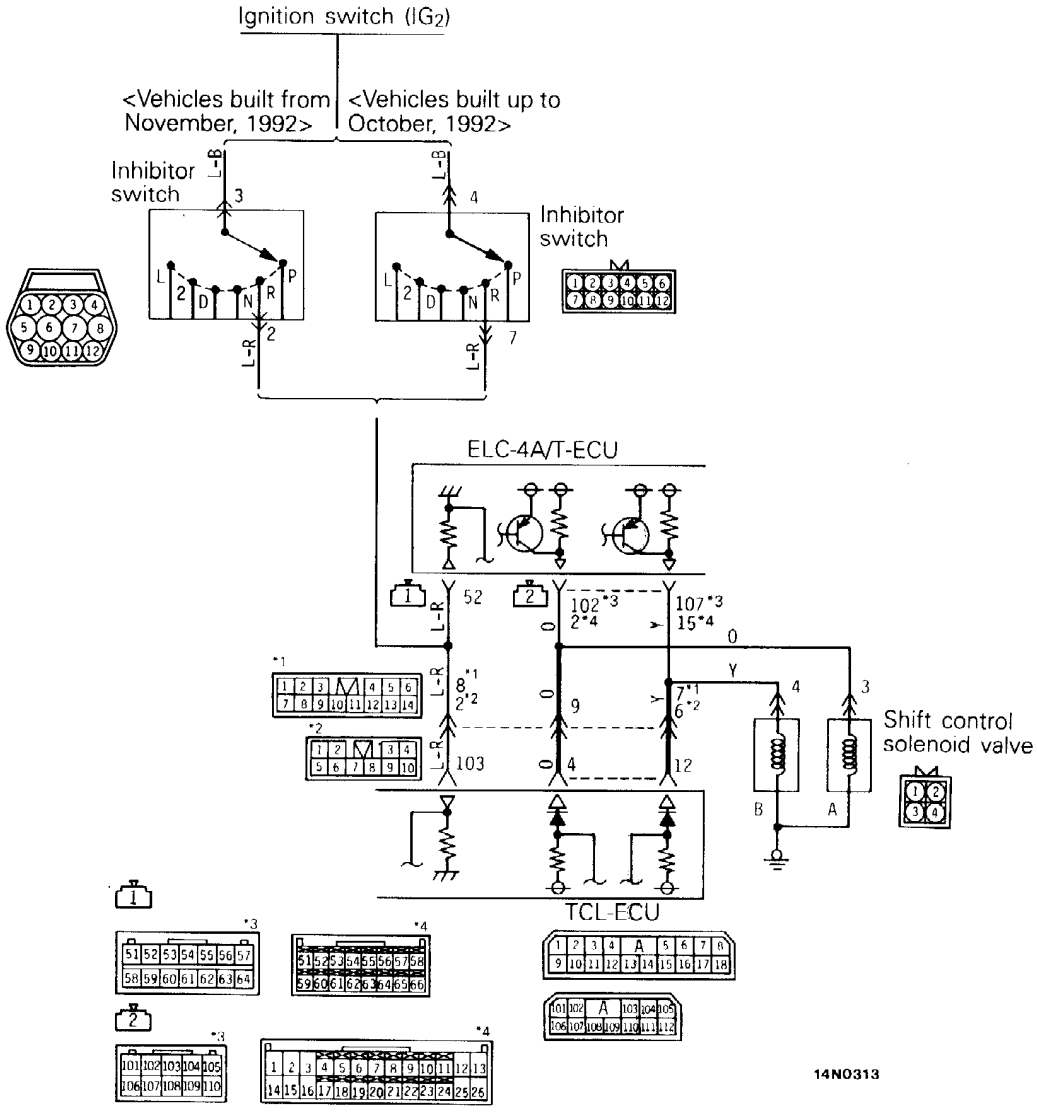
ADDED

G-2 When diagnosis code No. 12 or No. 13 is displayed <A/T>

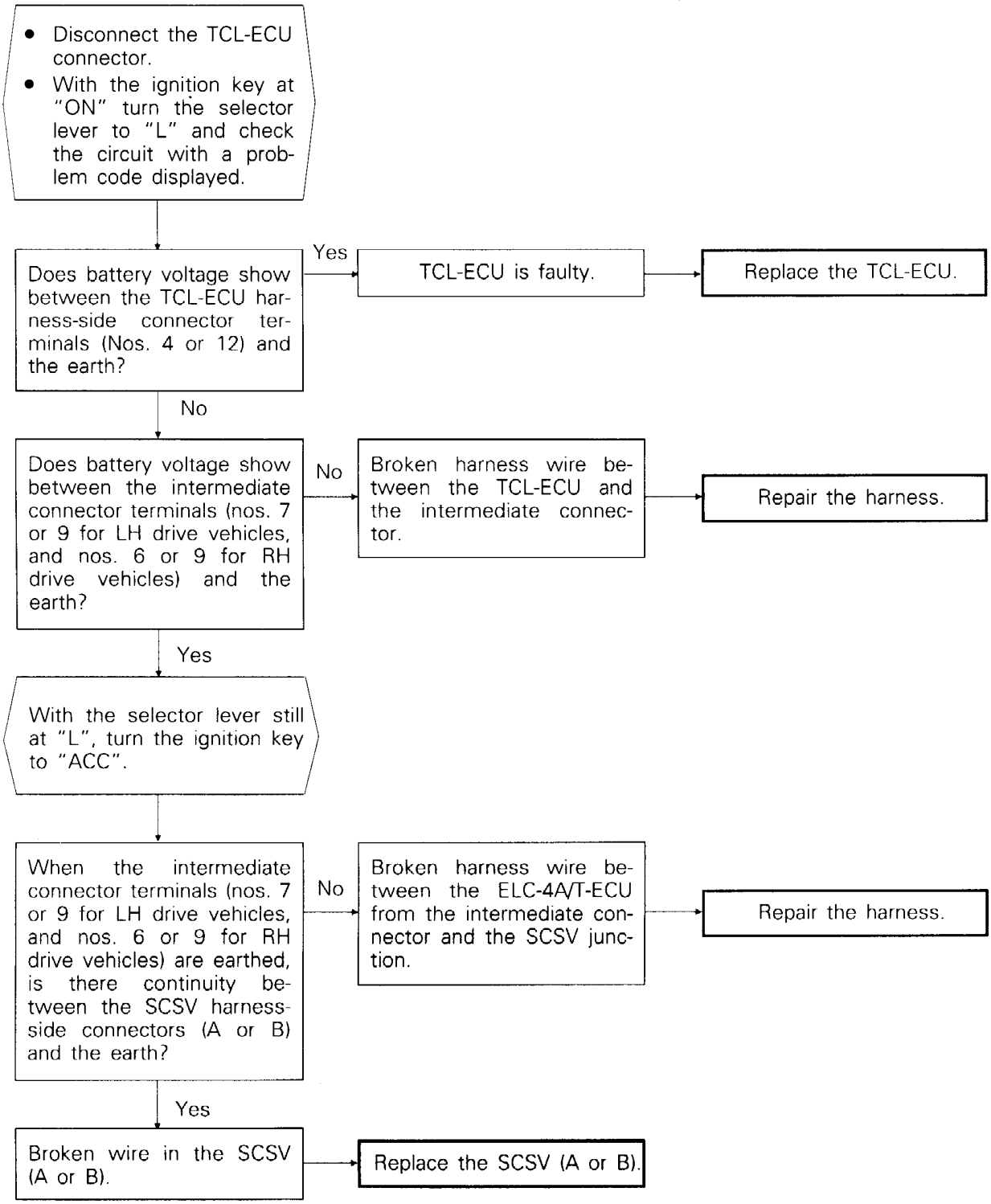
Comment: These problem codes are displayed when a broken wire is detected between the TCL-ECU and the SCSV (Shift Control Solenoid Valve) A or B. The TCL-ECU circuit will turn ON when there is a broken wire in the SCSV A or B, so when the inhibitor switch is at R and the SCSV A is ON, or when the vehicle speed is 100 km/h (62 mph) or more and the SCSV B is ON, the diagnosis will be a broken wire.

Hint: A broken wire between the ELC-4A/T-ECU and the SCSV A or B is detected from the ELC-ECU side. Therefore, if there is no problem with the ELC-4A/T side, then there is a high possibility that the thick wire shown in the diagram below is broken.

NOTE
Sometimes these codes will be output due to a short in the inhibitor switch "R" circuit, even when the SCSV A and B are normal.



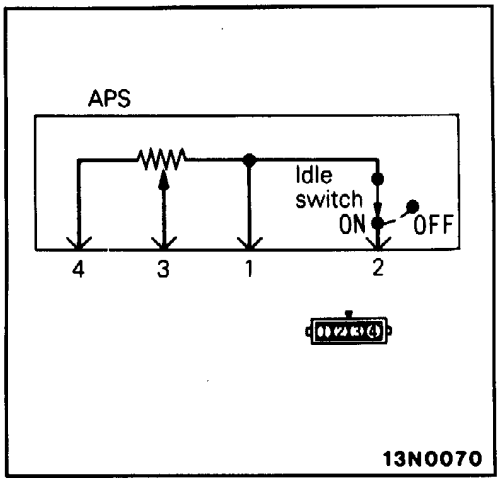
NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles
*3: Vehicles built up to October, 1991
*4: Vehicles built from November, 1991

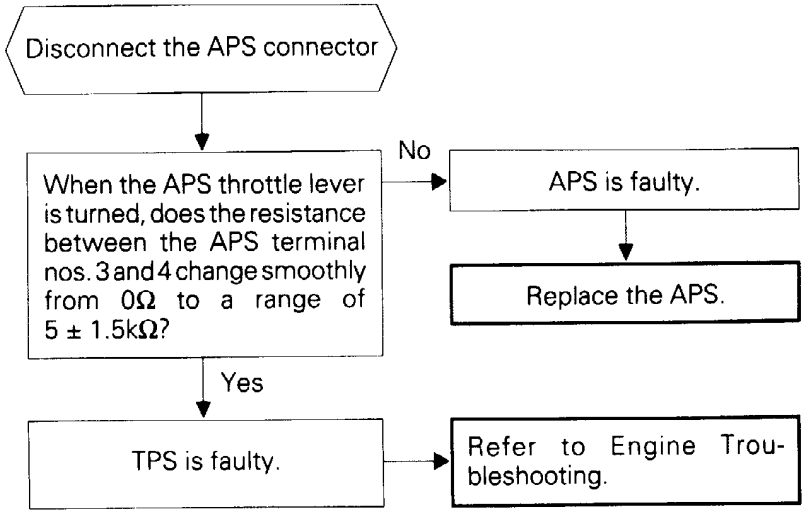

• Disconnect the TCL-ECU connector.
• With the ignition key at "ON" turn the selector lever to "L" and check the circuit with a problem code displayed.
Does battery voltage show between the TCL-ECU harness-side connector terminals (Nos. 4 or 12) and the earth?
Yes
TCL-ECU is faulty.
Replace the TCL-ECU.
No
Does battery voltage show between the intermediate connector terminals (nos. 7 or 9 for LH drive vehicles, and nos. 6 or 9 for RH drive vehicles) and the earth?
No
Broken harness wire between the TCL-ECU and the intermediate connector.
Repair the harness.
Yes
With the selector lever still at "L", turn the ignition key to "ACC".
When the intermediate connector terminals (nos. 7 or 9 for LH drive vehicles, and nos. 6 or 9 for RH drive vehicles) are earthed, is there continuity between the SCSV harness-side connectors (A or B) and the earth?
No
Broken harness wire between the ELC-4A/T-ECU from the intermediate connector and the SCSV junction.
Repair the harness.
Yes
Broken wire in the SCSV (A or B).
Replace the SCSV (A or B).

G-3 When diagnosis code No. 14 is displayed.

Comment: This problem code is displayed when the opening difference between the APS and TPS is 20° or greater due to a broken wire in the APS or TPS opening sensor circuit. If the APS has a broken wire, diagnosis code No. 11 is first displayed. Accordingly, when code No. 11 is not displayed, the APS power circuit is diagnosed to be normal.

Hint: As the opening of both the APS and the TPS can be read using the multi-use tester, it is better to take a reading of the data for each one to check for an abnormality.

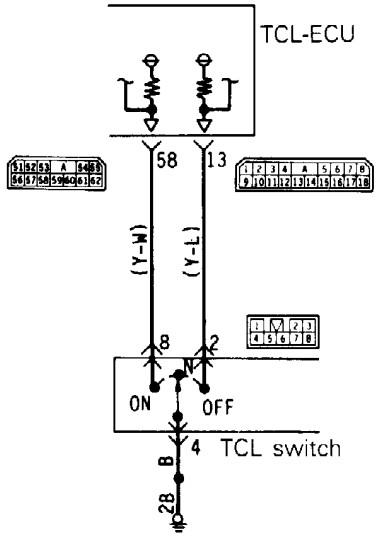




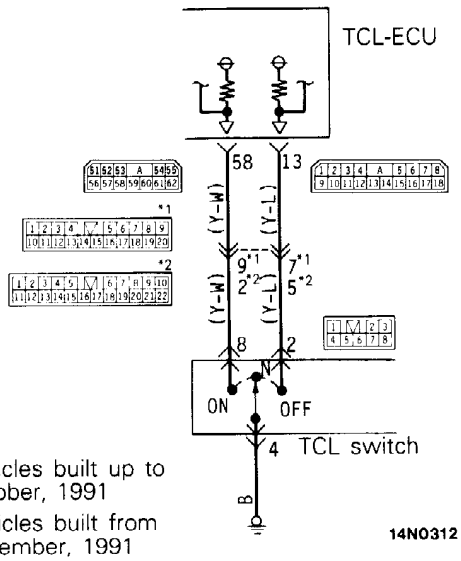
G-4 When diagnosis code No. 15 <A/T> or No. 24 <M/T> is displayed.

Comment: This problem code is displayed when an ON signal is input at the same time from both the TCL OFF and TRACE OFF positions because of a short, etc. in the TCL switch circuit.

LH drive vehicles



RH drive vehicles



NOTE
*1: Vehicles built up to October, 1991
*2: Vehicles built from November, 1991

Disconnect the TCL switch connector.

When the TCL switch is in the "ON" position, does a resistance of ∞Ω show between terminal nos. 2 and 4, or between terminal nos. 8 and 4?

No → Short in the TCL switch. → Replace the TCL switch.

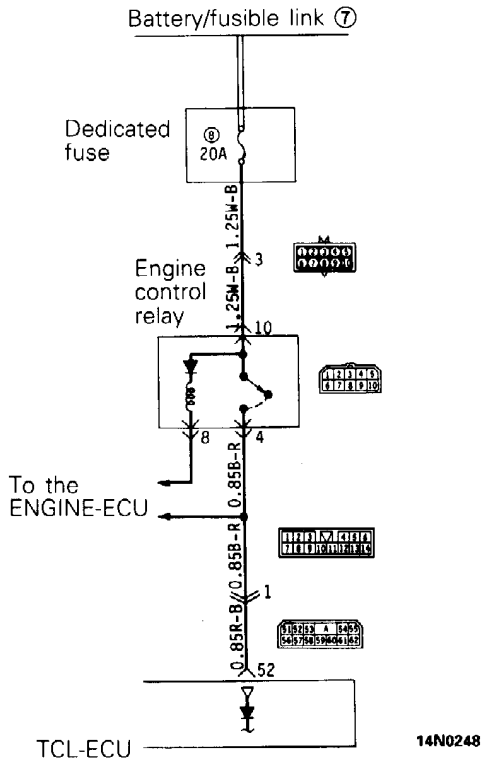
Yes → Short in the harness between the TCL-ECU and the TCL switch, or TCL-ECU is faulty. → Repair the harness, or replace the TCL-ECU.

G-5 When diagnosis code No. 16 <A/T> or No. 27 <M/T> is displayed.

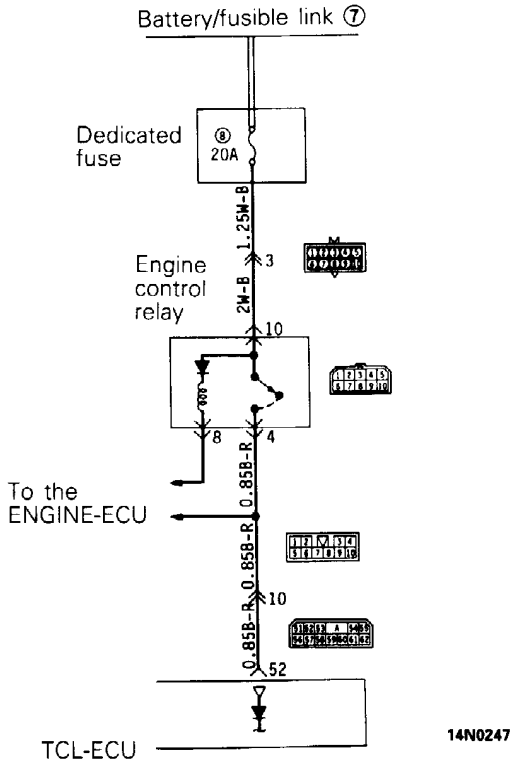
Comment: This problem code is displayed when the TCL-ECU power voltage is lower than the standard value. If the voltage returns to standard voltage or higher, this code will no longer be output.

Caution
If the battery voltage drops during inspection, this code will be output as a current problem, and correct problem diagnosis cannot be made. Before following the inspection below, check the battery condition, and recharge the battery if necessary.

<Vehicles built up to October, 1992>
LH drive vehicles

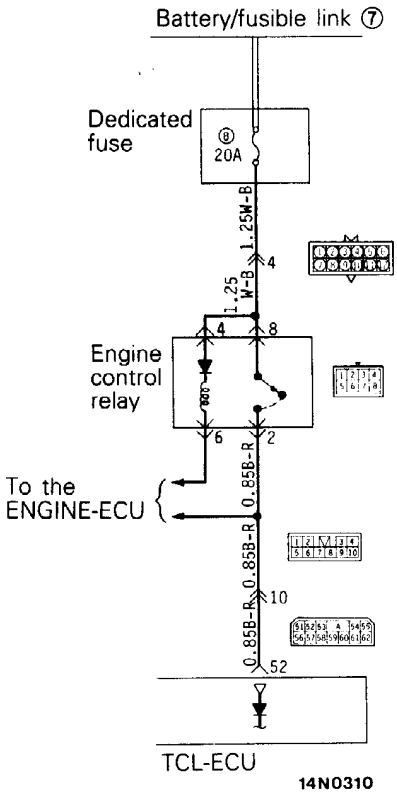


RH drive vehicles

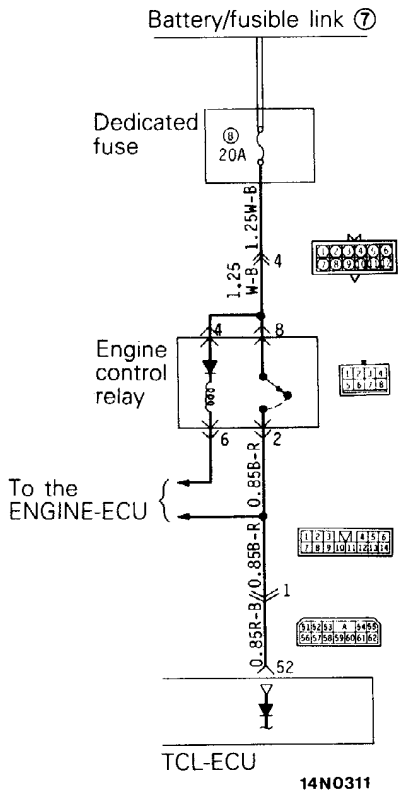


<Vehicles built from November, 1992>

L.H. drive vehicles



R.H. drive vehicles



Start engine idling.

Does a voltage of 10V or more show between the TCL-ECU power terminal No. 52 and the earth?

No → Are the contacts for the fuse and connectors normal and not faulty? (Inspect visually or measure the voltage reduction with a voltage meter.)

No → Repair the faulty contacts.

Yes → TCL-ECU is faulty.

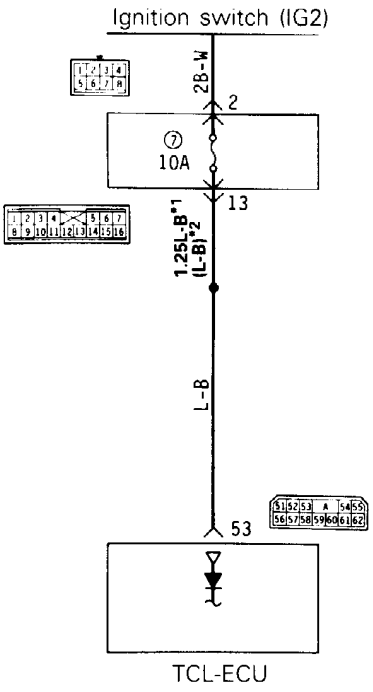
→ Replace the TCL-ECU.

Yes → Is the TCL-ECU connector properly connected? (If the connector is disconnected, check that there is no bend, etc. in the pin, or that the pin's contact pressure is sufficient.)

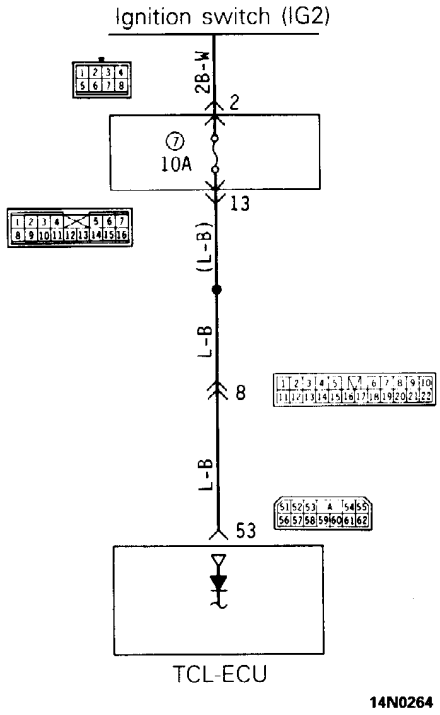
G-6	When diagnosis code No. 17 <A/T> or No. 26 <M/T> is displayed.

Comment: This problem code is displayed when engine revolutions is 450 rpm or higher and IG2 power is not supplied to the TCL-ECU because of a broken wire or short in the IG2 power circuit.

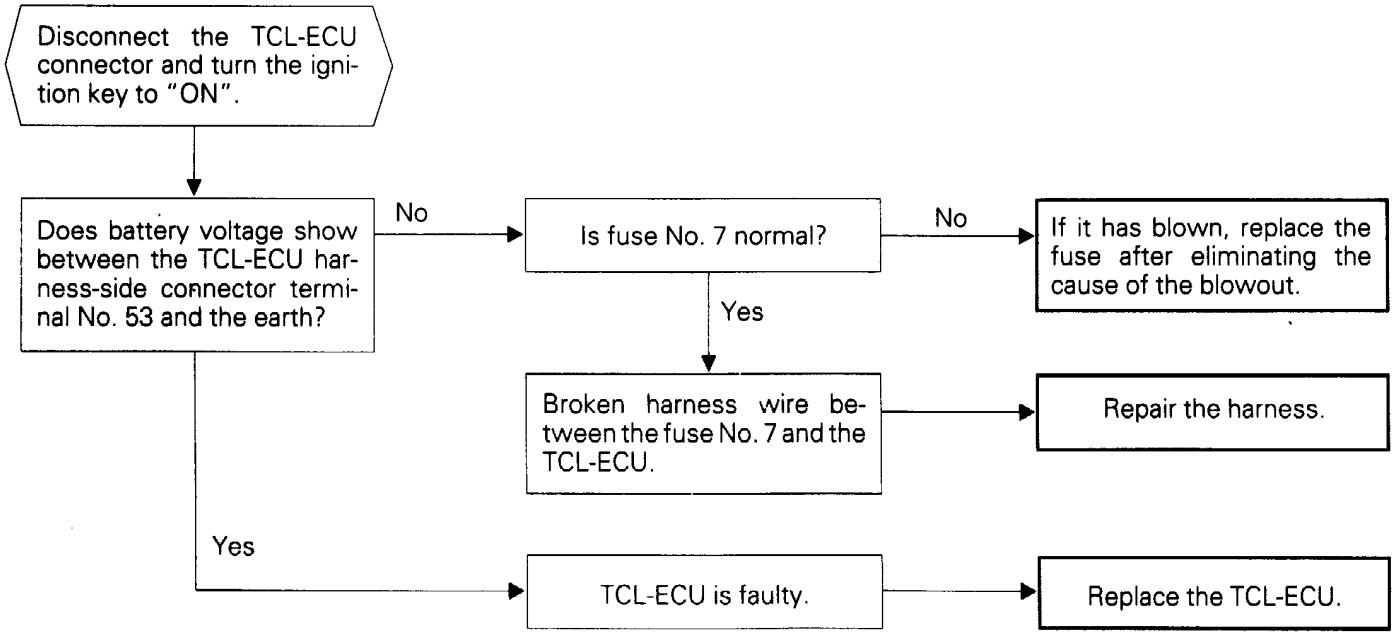
LH drive vehicles



RH drive vehicles



NOTE
*1: Vehicles built up to October, 1992
*2: Vehicles built from November, 1992



G-7	**<A/T> When diagnosis code No. 21, No. 22, No. 23 or No. 24 is displayed.** **<M/T> When diagnosis code No. 31, No. 32, No. 33 or No. 34 is displayed.**

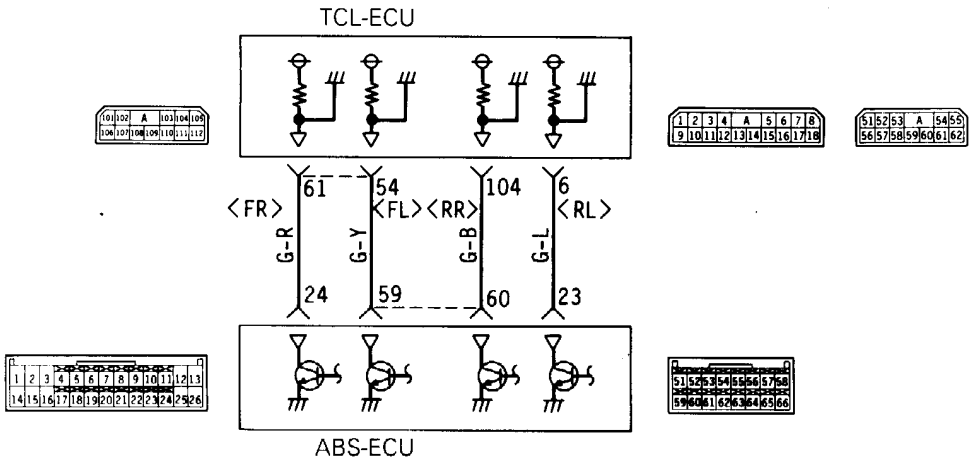
Comment: When diagnosis code No. 21 or 22 (No. 31 or 32 for M/T) is displayed.
These problem codes are displayed when a pulse is input by the sensor circuit due to a broken wire or short, or a faulty sensor, showing a wheel speed difference of 8 km/h (5 mph) or more in the front left and right wheels compared to the rear wheels.

When diagnosis code No. 23 or 24 (No. 33 or 34 for M/T) is displayed.

These problem codes are displayed when a pulse is input by the sensor circuit due to a broken wire or short, or a faulty sensor, showing a wheel speed difference of 8 km/h (5 mph) or more in the wheels on one side compared to the opposite side.

Hint: Problems between the ABS-ECU and the sensor are detected by the ABS-ECU. Therefore, if there is no problem with the ABS side, it is most likely due to a broken harness wire or a short between the ABS-ECU and the TCL-ECU.

NOTE
When these problem codes are output, erase the problem code memory after fixing the cause of the problem, and carry out a driving test at a speed of 20 km/h (12 mph) or higher to check that the codes are not output again.



Is there continuity between the following terminals of the ABS-ECU harness-side connector and the TCL-ECU harness-side connector?

	ABS side	TCL side
Terminal Nos.	59	54
	24	61
	23	6
	60	104

No → Broken harness wire or short. → Repair the harness.

Yes → Check the sensors with the ABS diagnosis system, and repair abnormalities if any. (Refer to GROUP 35 – Anti-lock Brake System Troubleshooting)

→ If a TCL diagnosis code is output once more, the TCL-ECU is faulty. → Replace the TCL-ECU.

G–8 When diagnosis code No. 25 <A/T> or No. 35 <M/T> is displayed

Comment: While driving at a speed of 20 km/h (12 mph) or over, this problem code is displayed when the pulse signal is stopped for an instant (0.015 sec.), due to a temporary disconnection in the sensor of both rear wheels. However, even when this code is displayed, the TCL OFF indicator will not illuminate or flash.
Furthermore, the ABS warning lamp illuminates due to a broken sensor wire in the ABS hardware circuit, and TCL diagnosis code No. 62 (No. 76 for M/T) will be displayed.

Hint: When diagnosis code No. 25 (No. 35 for M/T) is displayed at the same time as code nos. 23 or 24 (nos. 33 or 34 for M/T), inspect according to the troubleshooting for code nos. 23 or 24 (nos. 33 or 34 for M/T).
When code No. 25 (No. 35 for M/T) is displayed by itself, the problem is likely to be a faulty contact in the rear wheel sensor circuit.

Remedy: Inspect according to the same procedure for the ABS wheel speed sensor (rear) inspection. (Refer to GROUP 35 – Serive Adjustment Procedures)

G–9 When diagnosis code No. 26 <A/T> or No. 36 <M/T> is displayed

Comment: This problem code is displayed when an abnormality is diagnosed in the rear wheel sensor when the speed of both rear wheels is zero for 20 seconds while traction control is operating.

Hint: This problem occurs when there is a broken harness wire or short between the TCL-ECU and the ABS-ECU that leads to both rear wheels, or if the sensor harnesses for both rear wheel short at the same time.

NOTE
1. When the vehicle is stuck and only the front wheels are moving, or when the front wheels are jacked up and only the front wheels are moving, after 20 seconds the TCL indicator will begin to flash and the system will be isolated.
2. When this problem code is output, erase the problem code memory after fixing the cause of the problem, and carry out a driving test at a speed of 20 km/h (12 mph) or higher to check that the code is not output again.

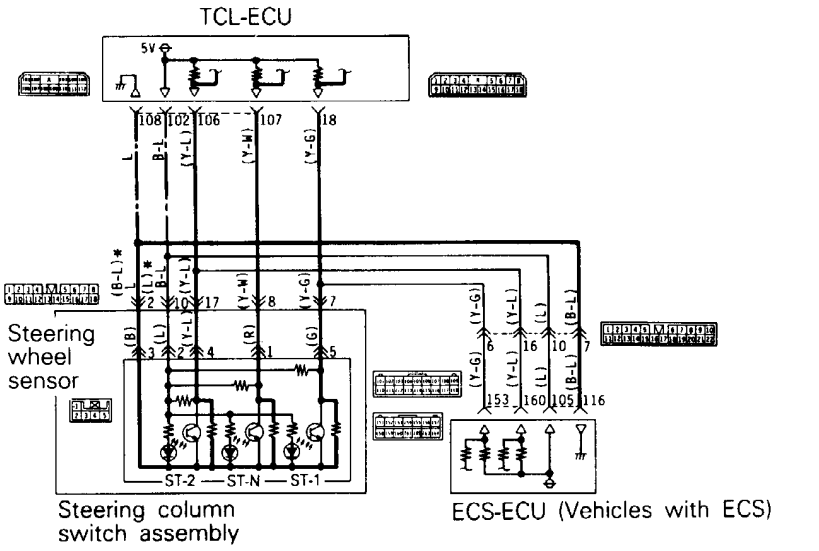
Remedy: Inspect according to the inspection flowchart in Troubleshooting Chart G-7 for diagnosis code nos. 21, 22, 23 and 24 (nos. 31, 32, 33 and 34 for M/T).

G–10	When diagnosis code No. 33 <A/T> or No. 47 <M/T> is displayed

Comment: This problem code is displayed when the steering wheel sensor circuit output wire (thick wire section) is broken.

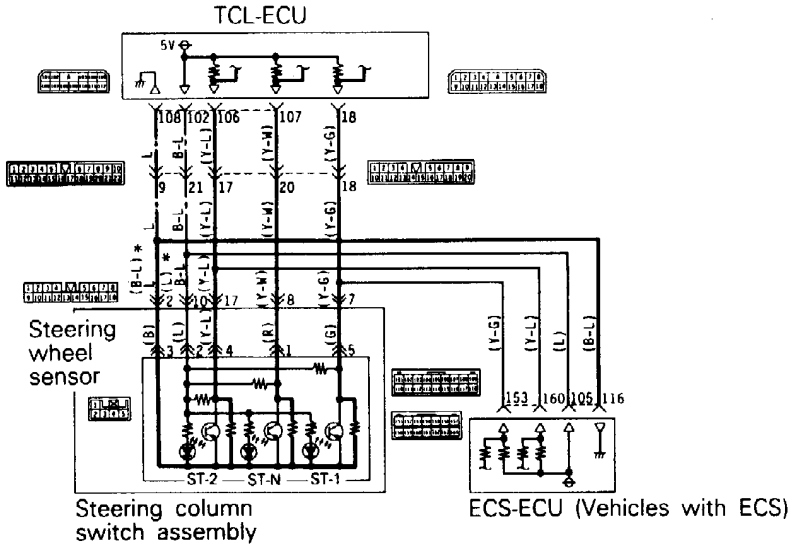
Hint: For vehicles fitted with ECS, the ECS function shares the ST-1 and ST-2 sensor circuit. For this reason, when diagnosis code No. 33 (No. 47 for M/T) is output, if the ECS warning lamp also illuminates and if the ECS diagnosis code No. 21 (No. 32 for M/T) is displayed, there is probably a broken wire in a circuit between the sensor and the harness junction of the ECS-ECU and the TCL-ECU.
If the ECS code is normal, then there is probably a broken wire in a circuit between the TCL-ECU and the harness junction of the ECS-ECU and the TCL-ECU.

LH drive vehicles



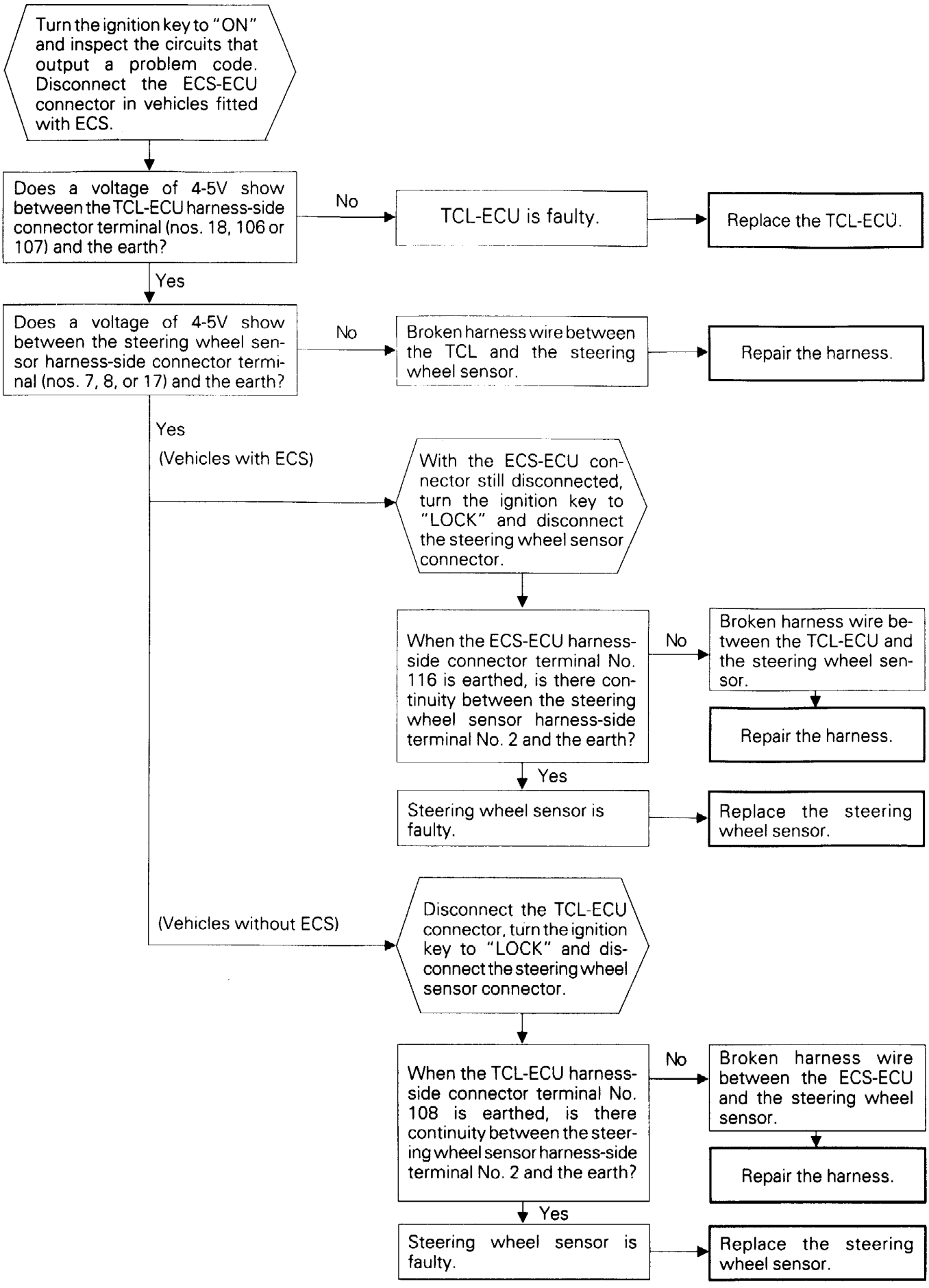
14N0262

RH drive vehicles



14N0263

NOTE
1. The diameter and color of wires marked with * indicate vehicles with ECS.
2. The dotted lines indicate vehicles without ECS.

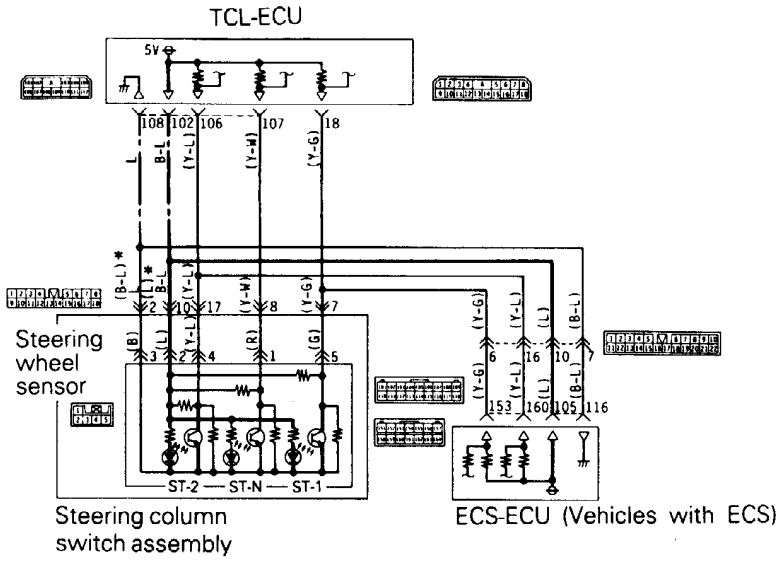


G–11	When diagnosis code No. 34 <A/T> or No. 44 <M/T> is displayed

Comment: This problem code is displayed when an abnormality is diagnosed in the steering wheel sensor power circuit (thick wire section) when the steering angle is less than 10° (no steering signal is input at all) and conditions are as follows:
- Vehicle speed: 20 km/h – 60 km/h (12 mph – 37 mph)
- Rear wheel speed sensor: When difference between left and right exceeds 1.5 km/h (1 mph) (diagnosed while cornering)

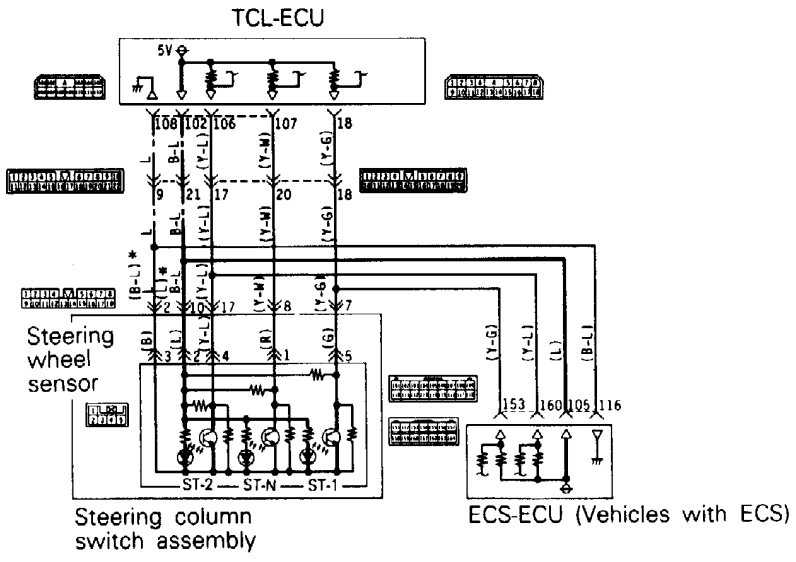
NOTE
It should be noted that if the vehicle is fitted with left and right tyres of different diameters, this code will sometimes be output while driving, even when the steering wheel sensor is normal.

LH drive vehicles



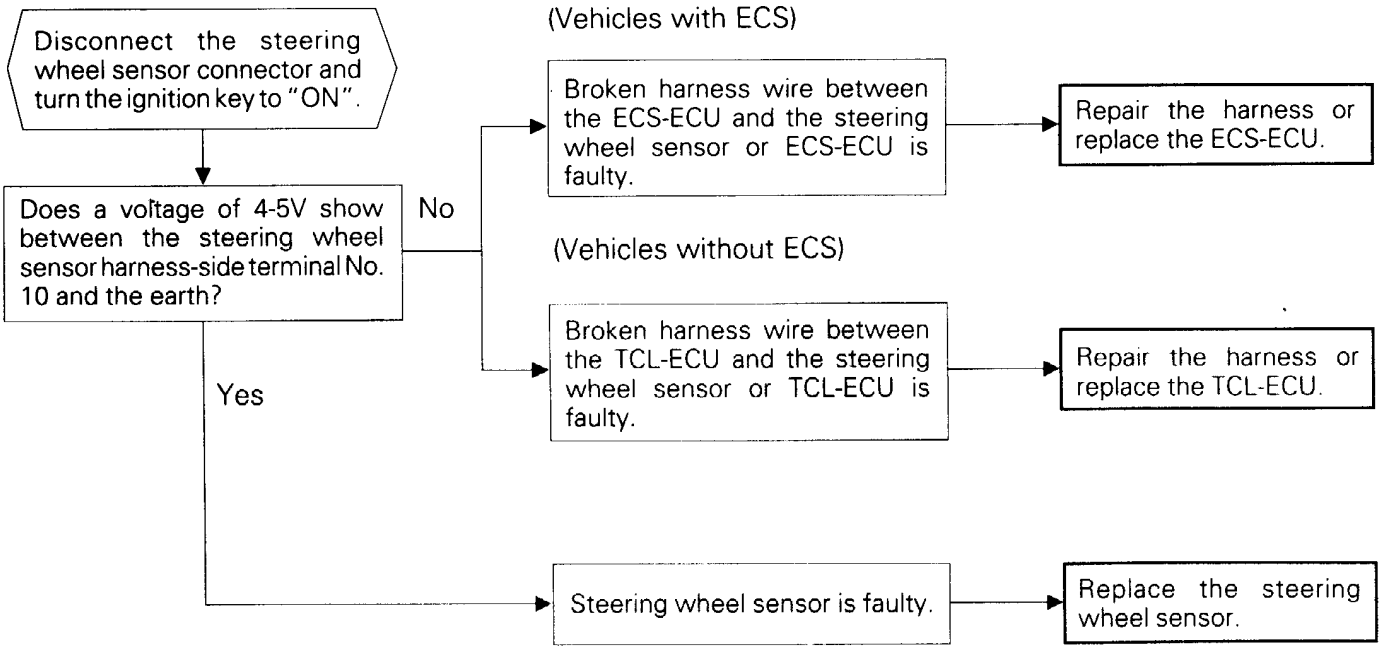
14N0256

RH drive vehicles



14N0257

NOTES
1. The diameter and color of wires marked with * indicate vehicles with ECS.
2. The dotted lines indicate vehicles without ECS.

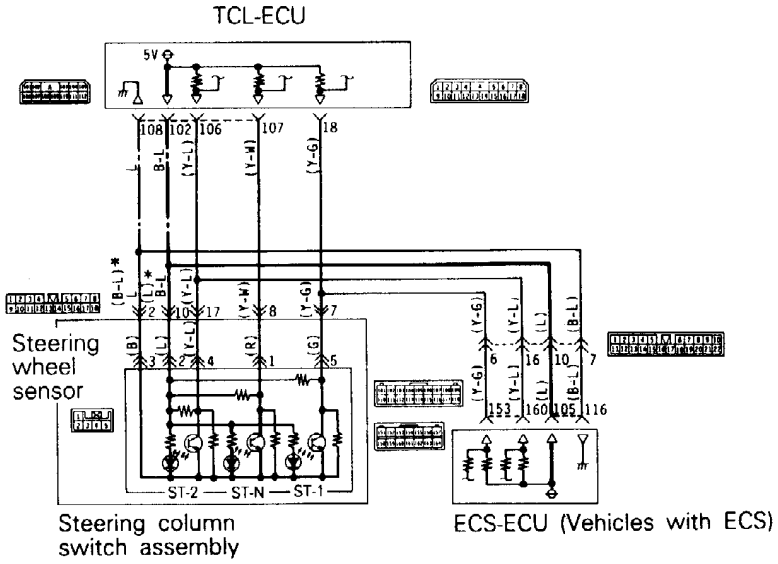


G-12 When diagnosis code No. 35 <A/T> or No. 45 <M/T> is displayed

Comment: This problem code is displayed when the steering wheel sensor ST-N circuit (thick wire section) is diagnosed as faulty, when the steering wheel is turned 400° or more, but "ST-N" position is not registered.

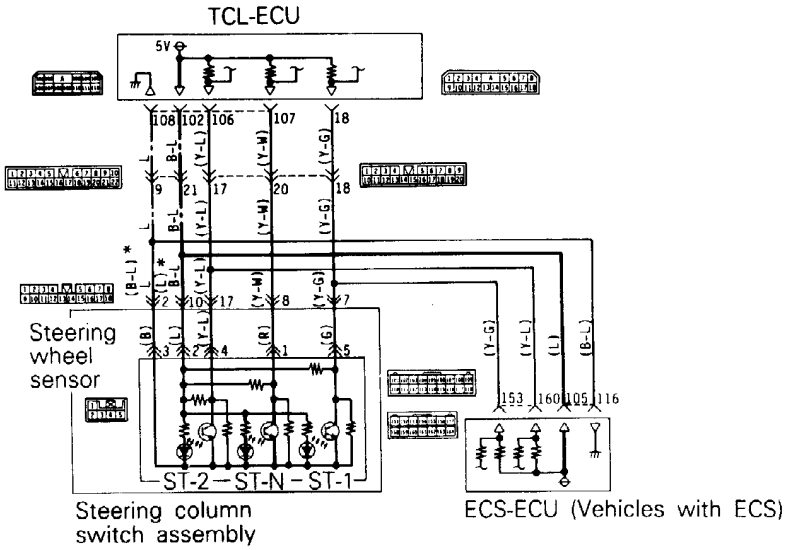
NOTE
Even if there is a problem, this code will not be displayed (detected) if the steering wheel is not turned.

LH drive vehicles



14N0260

RH drive vehicles



NOTES
1. The diameter and color of wires marked with * indicate vehicles with ECS:
2. The dotted lines indicate vehicles without ECS.

14N0261

Momentarily erase the diagnosis code.

When driving straight ahead at 20 km/h (12 mph) or above, is diagnosis code No. 34 (No. 44 for M/T) output?

No → Steering wheel sensor inner circuit (ST-N) is faulty. → Replace steering wheel sensor.

Yes

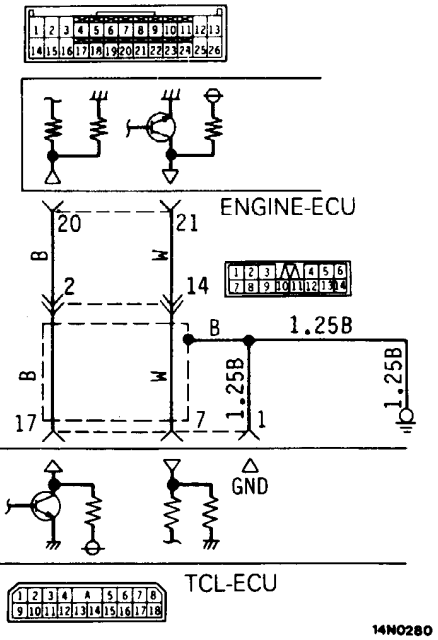
(Vehicles with ECS) → Broken harness wire between the ECS-ECU and the steering wheel sensor or ECS-ECU is faulty. → Repair the harness or replace the ECS-ECU.

(Vehicles without ECS) → Broken harness wire between the TCL-ECU and the steering wheel sensor or TCL-ECU is faulty. → Repair the harness or replace the TCL-ECU.

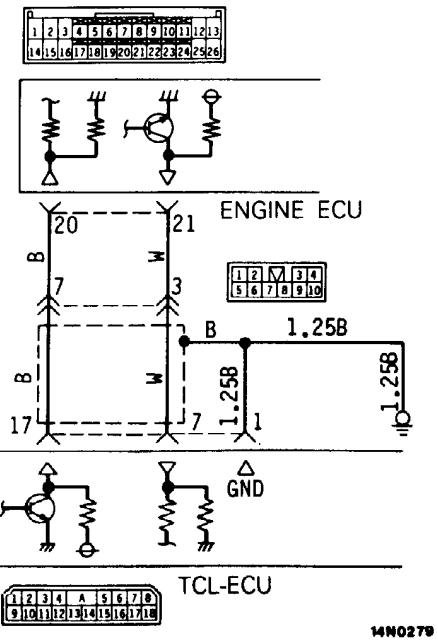
G-13 When diagnosis code No. 41 <A/T> or No. 71 <M/T> is displayed

Comment: This code is displayed when there is a problem in the serial communication circuit between the TCL-ECU and the engine-ECU caused by a broken wire or short, or if an error is detected in the communication due to a faulty ECU or shield wire.

LH drive vehicles



RH drive vehicles



Disconnect the TCL-ECU and engine-ECU connector.

When the TCL-ECU harness-side connector terminal nos. 7 or 2 and 17 are earthed respectively, is there continuity between the following terminals and the earth?
- between intermediate connector terminal No. 3, No. 14 and No. 7 and earth.
- between engine-ECU connector terminal nos. 20 and 21 and earth.

No → Broken wire in the harness with no continuity. → Repair the harness.

Yes

Is there continuity between the TCL-ECU harness side connector terminals (No. 7 or 17) and the earth?

Yes → Short in the harness between the TCL-ECU and the engine-ECU. → Repair the harness.

No

In there continuity between the terminal No. 7 and No. 17 of the TCL-ECU harness side connector?

Yes → Short in the harness between the TCL-ECU and the engine-ECU. → Repair the harness.

No

Replace the engine-ECU with the ECU normally functioned temporarily.

Is a diagnosis code output by the TCL-ECU?

No → Engine-ECU is faulty. → Replace the engine-ECU.

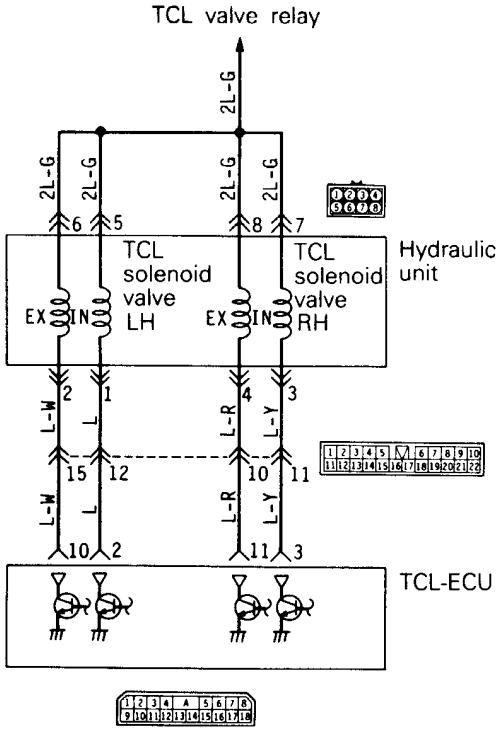
Yes

TCL-ECU is faulty. → Replace the TCL-ECU.

G–14	<A/T> When diagnosis code No. 51, No. 52, No. 53, or No. 54, is displayed <M/T> When diagnosis code No. 61, No. 62, No. 63 or No. 64 is displayed

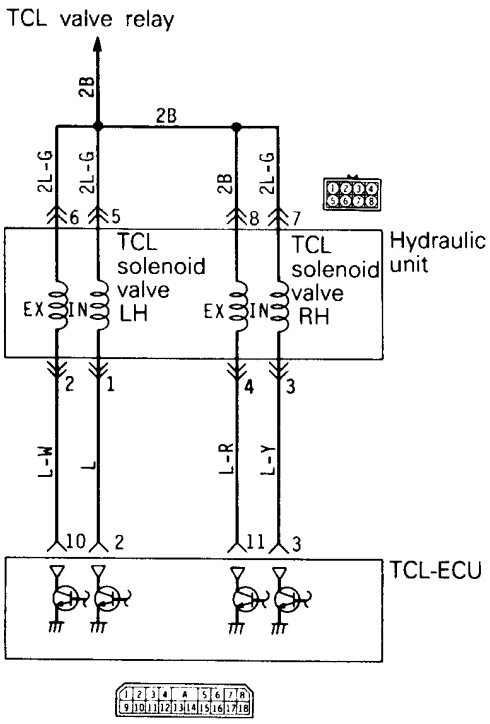
Comment: These codes are displayed when a broken coil wire or short is diagnosed in the solenoid valve or the in the harness when the ignition key is "ON" and the TCL-ECU initial check shows that the solenoid valve is ON but no current is flowing, or the solenoid valve is OFF but current is flowing.

LH drive vehicles

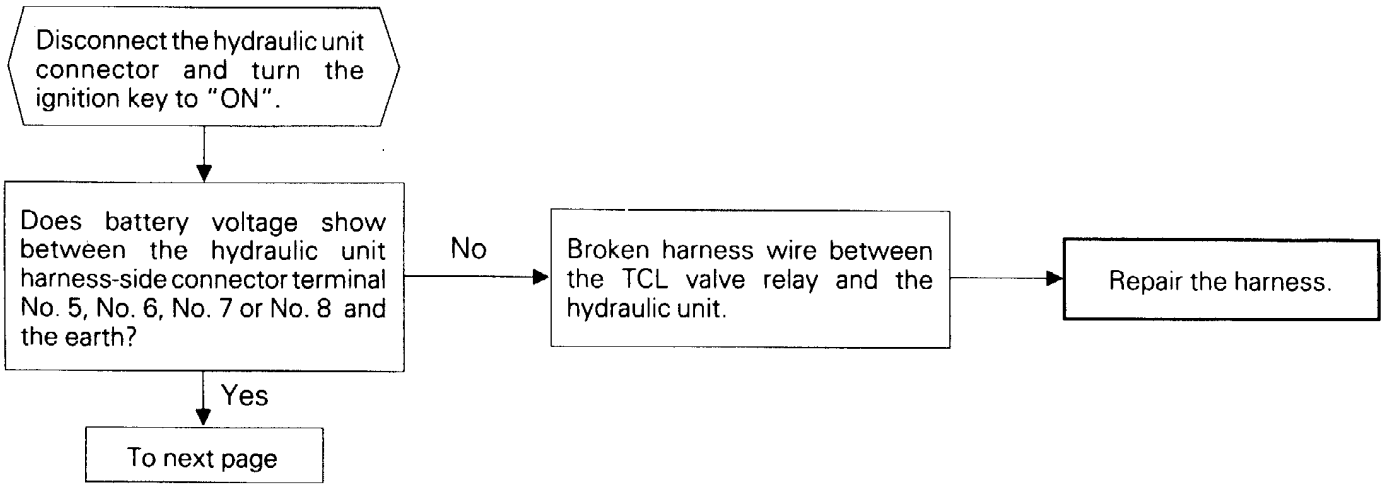


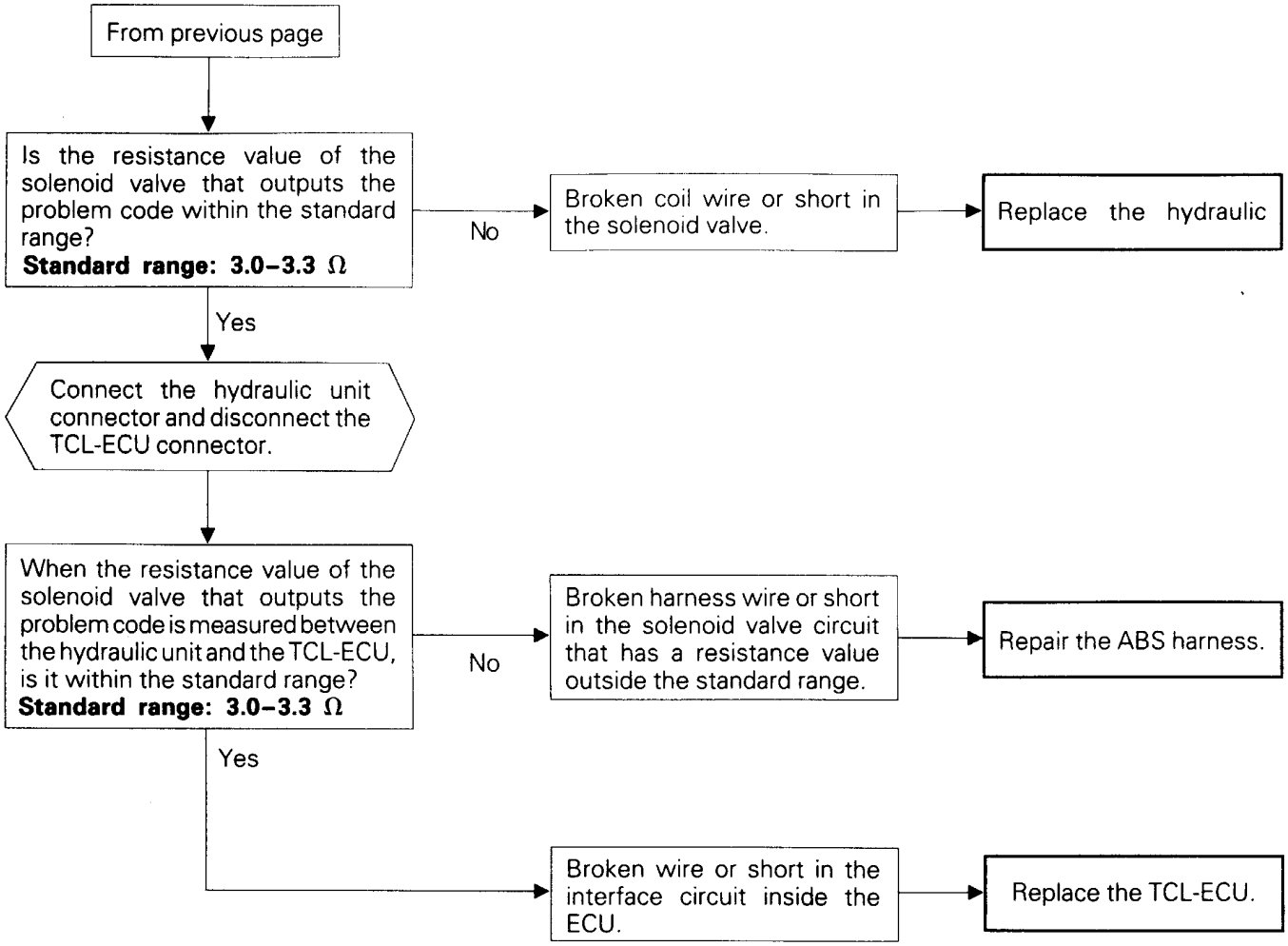
14N0243

RH drive vehicles



14N0244



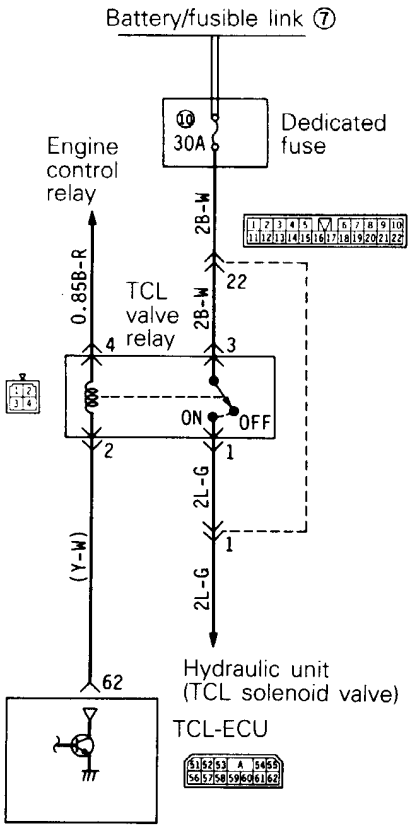

From previous page
Is the resistance value of the solenoid valve that outputs the problem code within the standard range?
Standard range: 3.0–3.3 Ω
No
Broken coil wire or short in the solenoid valve.
Replace the hydraulic
Yes
Connect the hydraulic unit connector and disconnect the TCL-ECU connector.
When the resistance value of the solenoid valve that outputs the problem code is measured between the hydraulic unit and the TCL-ECU, is it within the standard range?
Standard range: 3.0–3.3 Ω
No
Broken harness wire or short in the solenoid valve circuit that has a resistance value outside the standard range.
Repair the ABS harness.
Yes
Broken wire or short in the interface circuit inside the ECU.
Replace the TCL-ECU.

G–15	When diagnosis code No. 55 <A/T> or No. 65 <M/T> is displayed

Comment: This problem code is displayed when the ignition key is "ON" and the TCL-ECU initial check shows that the TCL valve relay is ON but no power is supplied to the solenoid valve, or power is being supplied but none of the solenoid valves are operating.

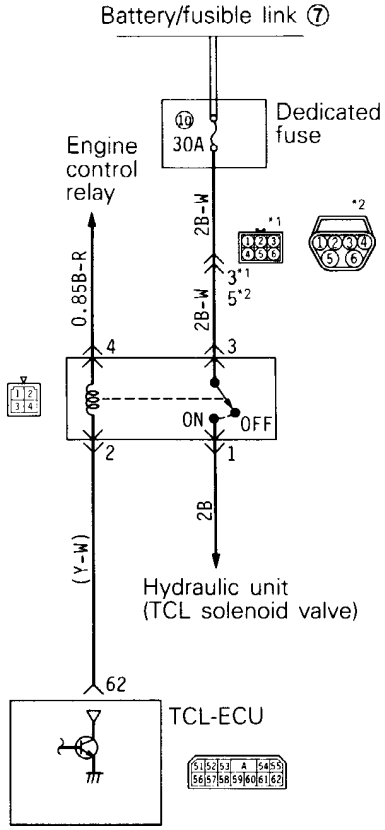
Hint: When diagnosis code No. 51, No. 52, No. 53 or No. 54 (No. 61, No. 62, No. 63 or No. 64 for M/T) are displayed, inspect according to the troubleshooting for code No. 51, No. 52, No. 53 and No. 54 (No. 61, No. 62, No. 63 and No. 64 for M/T).

LH drive vehicles



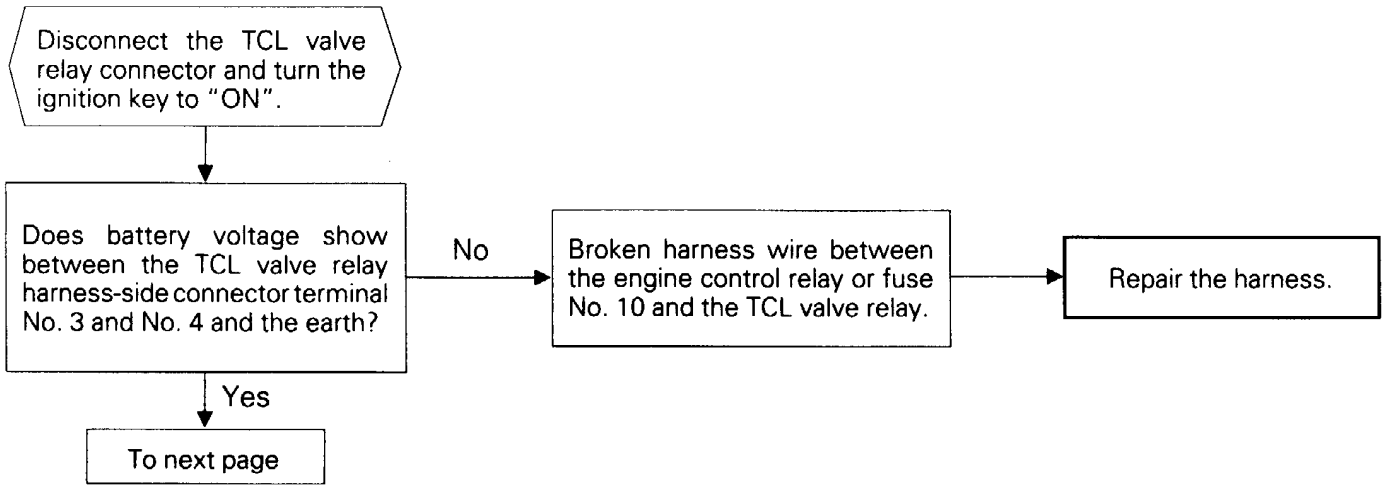
14N0240

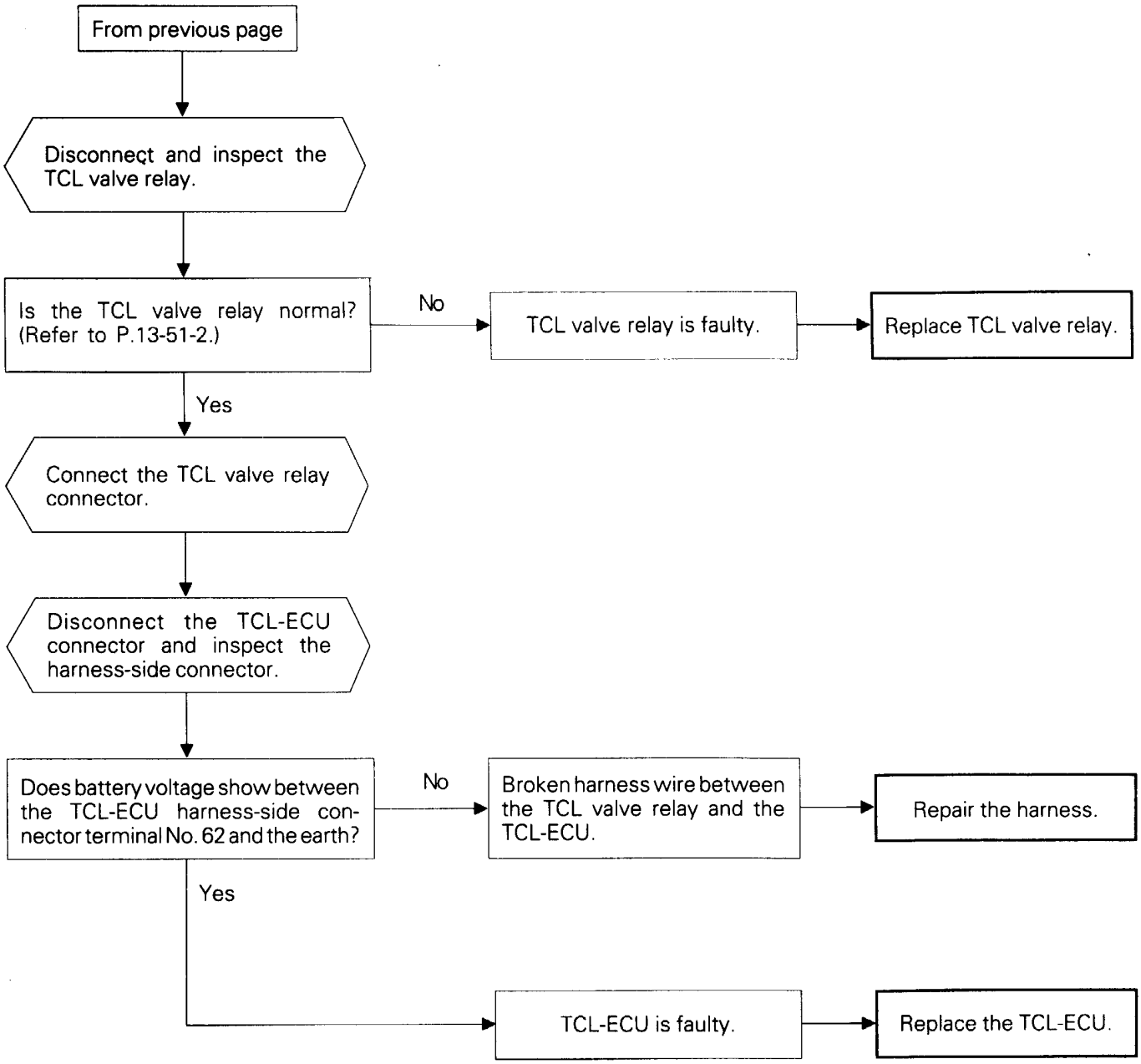
RH drive vehicles



NOTE
*1: Vehicles built up to October, 1992
*2: Vehicles built from November, 1992

14N0307





G–16 When diagnosis code No. 56 <A/T> or 66 <M/T> is displayed

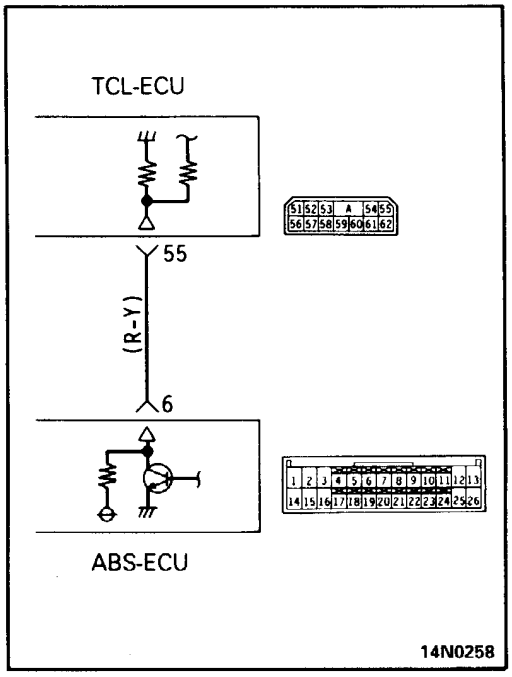
Comment: This problem code is displayed when the solenoid valve is ON (increase in pressure) for a longer than normal time when taking off on a slippery road surface, due to a faulty TCL-ECU interface circuit, etc.

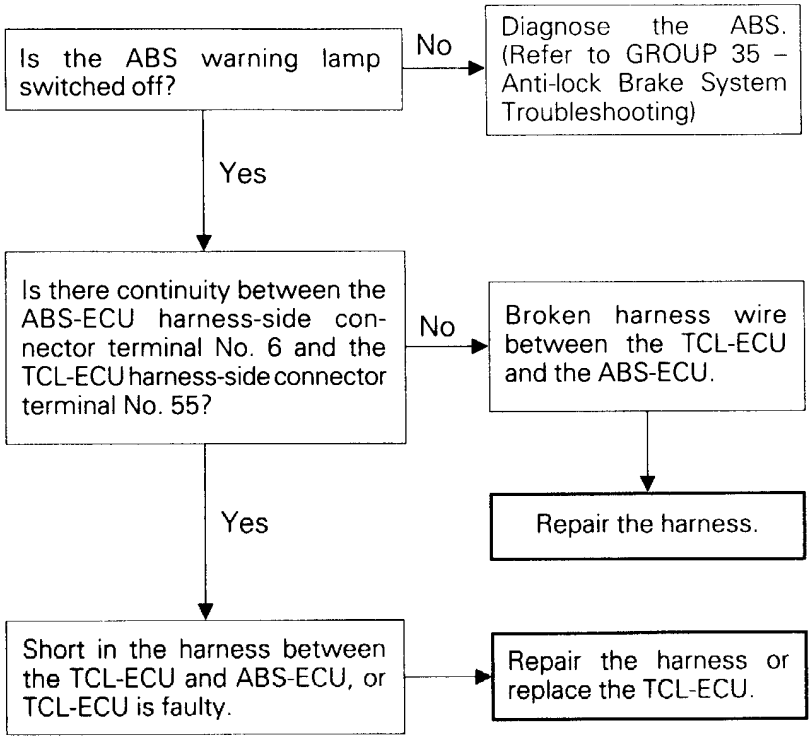
Remedy: Inspect according to the troubleshooting for diagnosis code No. 51, No. 52, No. 53, No. 54 and No. 55 (No. 61, No. 62, No. 63 and No. 64 for M/T), and if the TCL valve relay and solenoid valve are normal, the TCL-ECU is faulty and should be replaced.

G–17 When diagnosis code No. 61 <A/T> or No. 77 <M/T> is displayed

Comment: This problem code is displayed when the ABS signal during operation stays off for a long period of time (90 seconds or more), due to a broken harness wire or short between the TCL-ECU and the ABS-ECU, or if the ABS-ECU and TCL-ECU interface circuit is faulty.

Hint: If the ABS warning lamp remains off after the engine is started, it is probably caused by a broken harness wire or short between the ABS-ECU and the TCL-ECU.

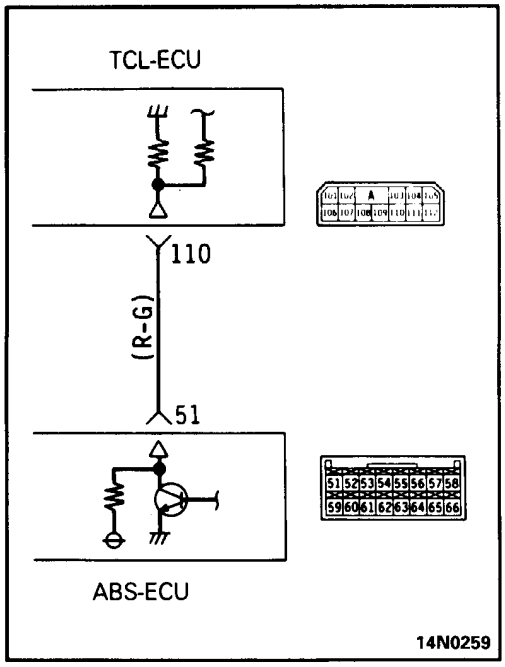


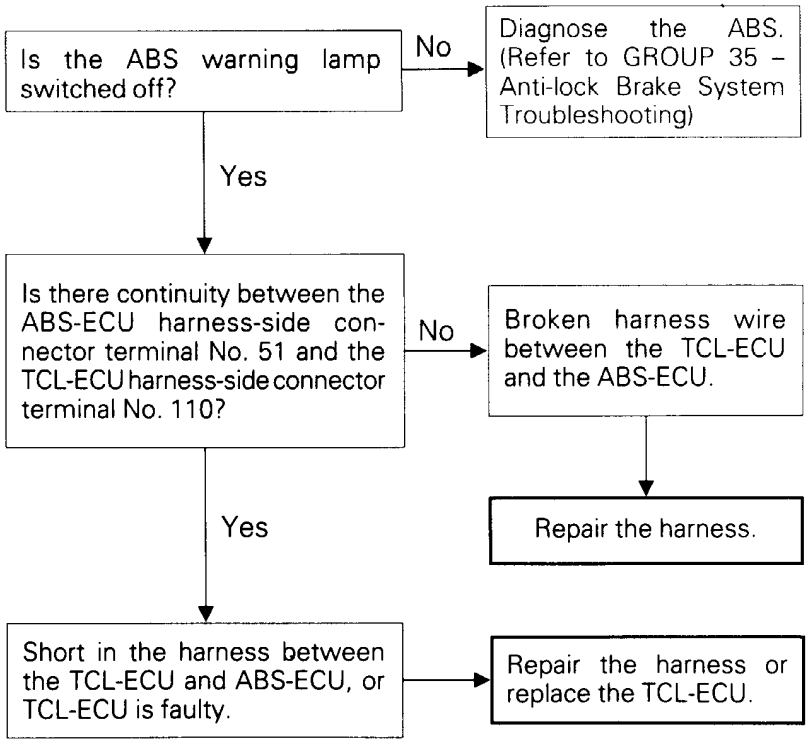


G–18 When diagnosis code No. 62 <A/T> or No. 76 <A/T> is displayed

Comment: This diagnosis code is displayed when the ignition key is "ON" and the TCL OFF indicator illuminates while the ABS-ECU is operating and the ABS warning lamp is illuminated.
If the condition returns to normal, this problem code will not be output.

Hint: If the ABS warning lamp remains off after the engine is started, there is probably a broken harness wire or short between the ABS-ECU and the TCL-ECU.





G–19 When diagnosis code No. 63 <A/T> or No. 67 <A/T> is displayed

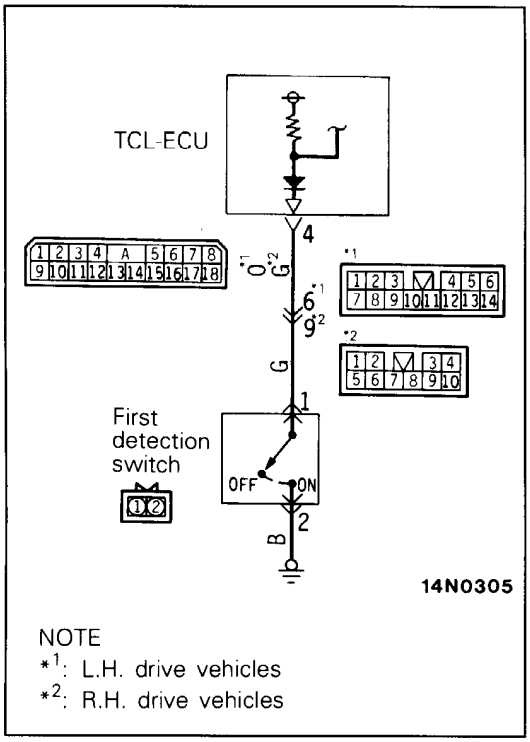
Comment: This problem code is displayed when the input signal for when ABS is operating (ABS 0 is the L signal), and the input signal for when ABS fails (ABS 1 is the L signal) are input by the TCL-ECU at the same time.
If the condition returns to normal, this problem code will not be output.

Remedy: Inspect according to troubleshooting for diagnosis code nos. 61 and 62 (nos. 76 and 77 for M/T).

G-20 When diagnosis code No. 54 is displayed <M/T>

Comment: The TCL-ECU detects the transmission gear positions from calculations based on the engine speed and front wheel speed.
Separately from this, when the gear position is 1st gear, an ON signal from the first detection switch is input to the TCL-ECU.

This malfunction code is output if a condition where the first detection switch is OFF for a continuous period of 60 seconds or more even though the calculation value displayed is that for 1st gear, the TCL-ECU judges that there is an open circuit in the first detection switch circuit.



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Disconnect the first detection switch connector.

Does the first detection switch operate normally?
- When the transmission gear is at the 1st range, there is continuity between the connector terminals.
- When the transmission gear is out of the 1st range, there is continuity between the connector terminals.

Yes → Is there continuity between the first detection switch harness side connector terminal No. 2 and earth?

No → Replace the first detection switch.

Is there continuity between the first detection switch harness side connector terminal No. 2 and earth?

No → Broken harness wire between the first detection switch and earth. → Repair the harness.

Yes → Disconnect the TCL-ECU connector and inspect at the harness side connector?

When the transmission gear is shifted at the 1st range, is there continuity between the TCL-ECU connector terminal No. 4 and earth?

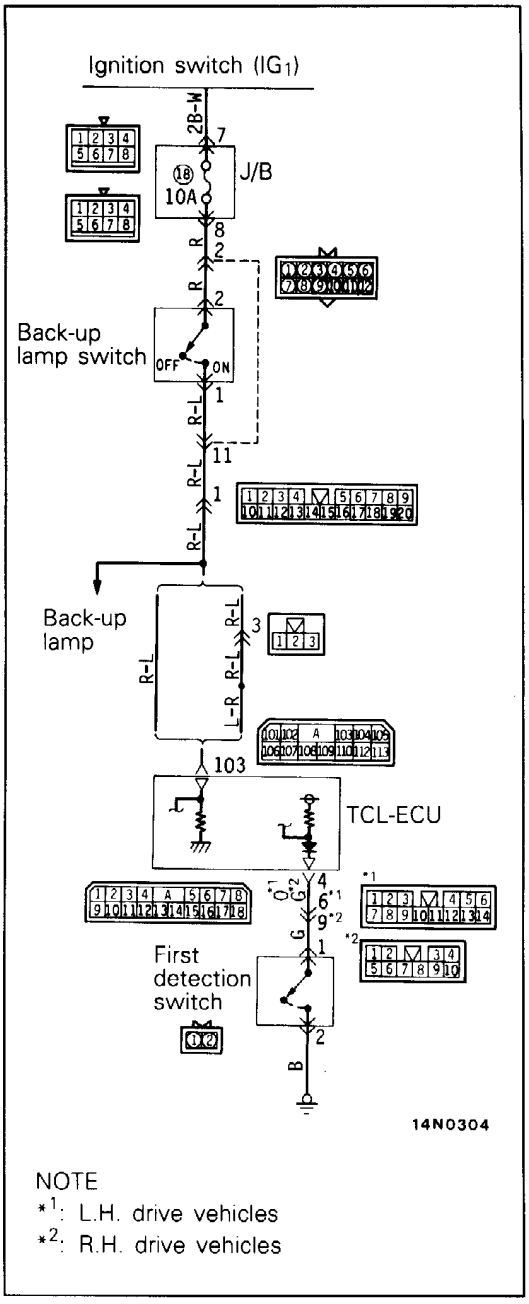
No → Broken harness wire between the TCL-ECU and the first detection switch. → Repair the harness.

Yes → TCL-ECU is faulty.

→ Replace the TCL-ECU.

G-21 When diagnosis code No. 55 is displayed <M/T>

Comment: This malfunction code is output if the first detection switch which turns ON when the transmission gear is in 1st position and the back-up lamp switch which turns ON when the transmission gear is in the reverse position are ON simultaneously.
If this malfunction code is output, the cause is probably an ON malfunction of the first detection switch or back-up lamp switch.



Is the back-up lamp switched on or off normally?
- No → Inspect the back-up lamp related circuit and repair the faulty location.

Disconnect the first detection switch connector and inspect.

Does the first ditection switch operate normally?
- When the transmission gear is at the 1st range, there is continuity between the connector terminals.
- When the transmission gear is out of the 1st range, there is no continuity between the connector terminals.

- No → Replace the first detection switch.
- Yes → Disconnect the TCL-ECU connector and inspect at the harness side connector?

When the transmission gear is switched in any range other than reverse range with the ignition key "ON", does a voltage of 0 V show between the TCL-ECU connector terminal No. 103 and earth.
- No → Broken harness wire between the back-up lamp switch and the TCL-ECU. → Repair the harness.
- Yes → When the transmission gear is shifted in any range other than 1st range, is there continuity between the TCL-ECU connector terminal No. 4 and earth?
  - No → TCL-ECU is faulty. → Replace the TCL-ECU.
  - Yes → Broken harness wire between the TCL-ECU and the first detection switch. → Repair the harness.

4. DIAGNOSIS FLOW CHART II

3. When driving in an area where TCL would not operate, the TCL indicator (green) illuminates and takeoff is impossible or engine gives poor acceleration.
4. In an area where TCL should operate, it does not operate [TCL indicator (green) does not illuminate].

Comment: The TCL control unit only detects the causes of nearly all of the above problems for a short time by its self diagnosis function, but the detection time for the following problems is long, so until the TCL OFF indicator starts flashing and a problem code is output, sometimes one of the above problems can develop. Also, if there is a disagreement between the input value from the steering wheel sensor and the actual steering angle, the trace control will operate, even in areas where the TCL would not normally operate.

After checking if the problem reoccurs, inspect according to the following procedure.

3. When driving in an area where TCL would not operate, the TCL indicator (green) illuminates and takeoff is impossible or engine gives poor acceleration.

During takeoff, TCL is operating and engine output does not increase.

If there is continuous pressure on the accelerator pedal for 20 seconds or more, does the TCL OFF indicator flash?

No → TCL-ECU is faulty.

Yes →

Malfunction in the rear wheel speed sensors. (Refer to GROUP 35 – Service Adjustment Procedures)
- Excessive clearance between the sensor pole and rotor of the rear wheel speed sensor (both wheels).
- Broken wire or short in the wheel speed signal harness between the ABS-ECU and the TCL-ECU (both wheels).

While driving, TCL is operating and engine gives poor acceleration.

Is tyre pressure normal? (Is there no major difference between the diameters of the rear tyres?)

No → Adjust to the standard pressure (change to standard tyres.)

Yes →

Is the steering wheel centred?

No → Reattach the steering wheel correctly.

Yes →

- Is the length of the steering wheel linkage tie rod even at both ends?
- Is the length of the rear steering power cylinder tie rod even at both ends? <vehicles with 4WS>

→ Adjust the length of the tie rod so the length of the ends are even (after adjusting, the steering wheel should be centered).

Yes →

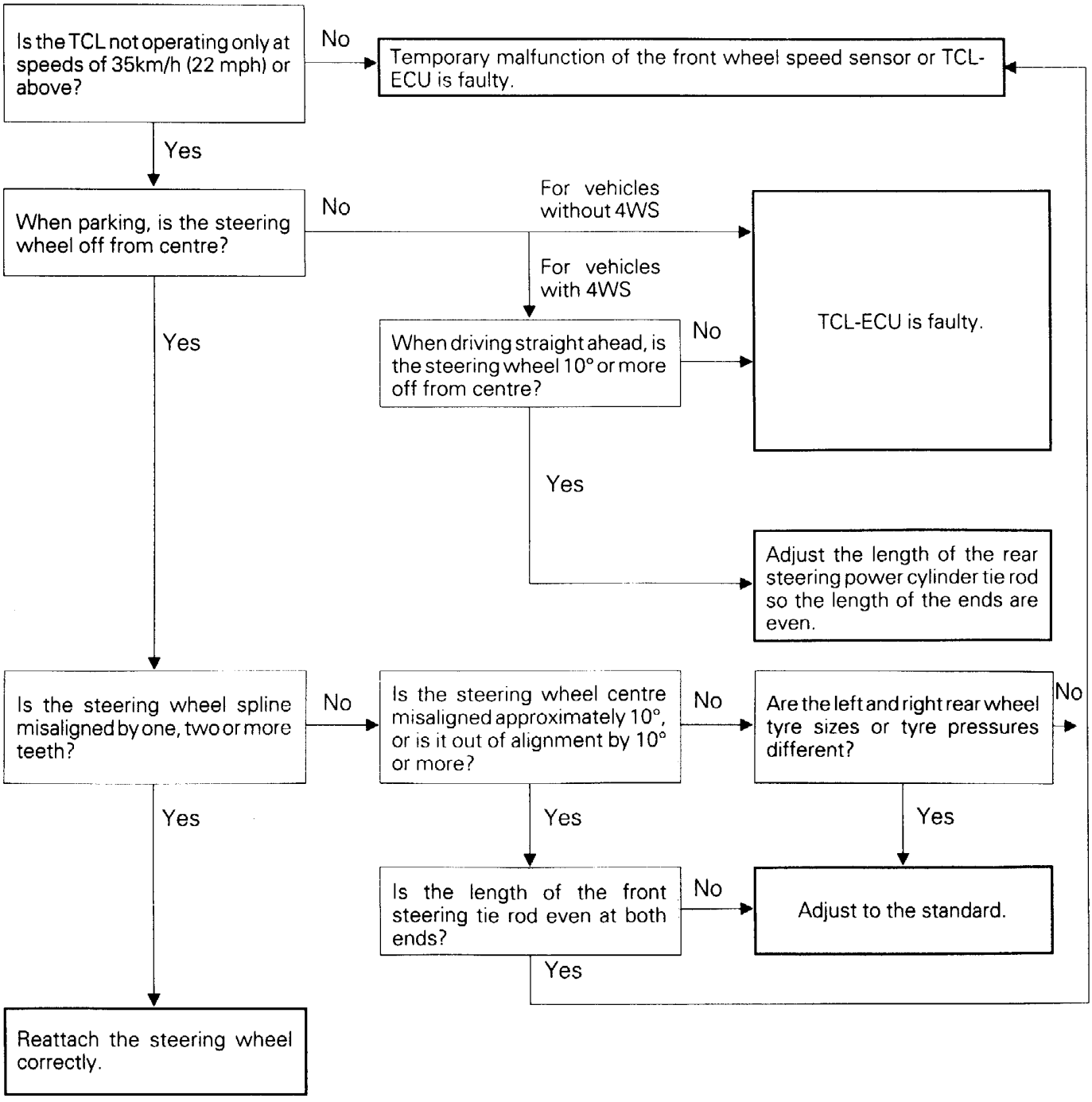
Temporary malfunction of the rear wheel speed sensor.

→ Refer to inspection flowchart related to the wheel speed sensors (GROUP 35 – Anti-lock Brake System Troubleshooting).

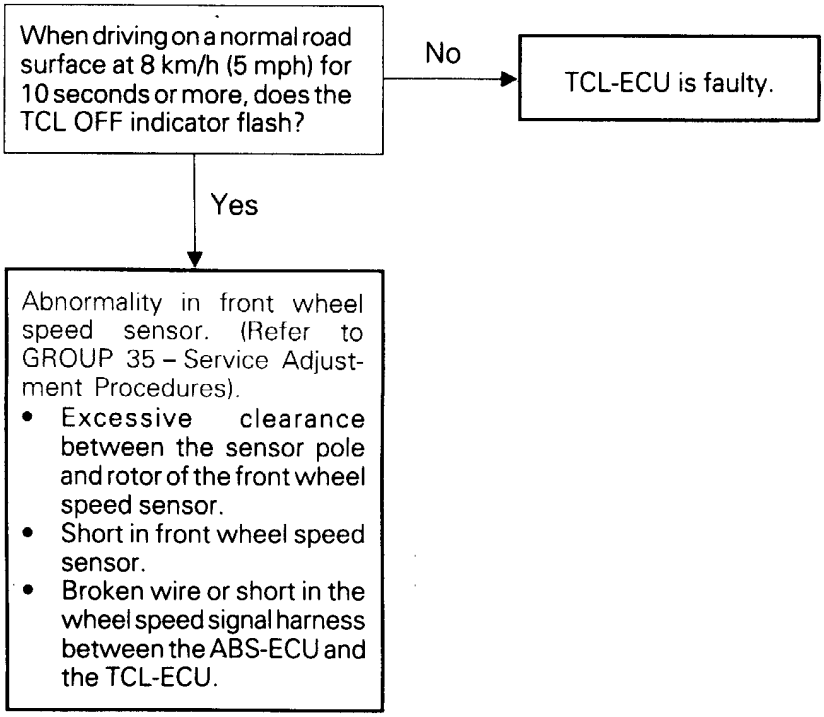
4. In an area where TCL should operate, it does not operate [TCL indicator (green) does not illuminate].

NOTE
This inspection flowchart is suitable for use if the ignition key is "ON" and the TCL OFF indicator illuminates, and then switches off after the engine is started.

When accelerating during turning on normal road surfaces and the TCL does not operate.



When taking off on a slippery road surface and TCL does not operate.



TROUBLESHOOTING

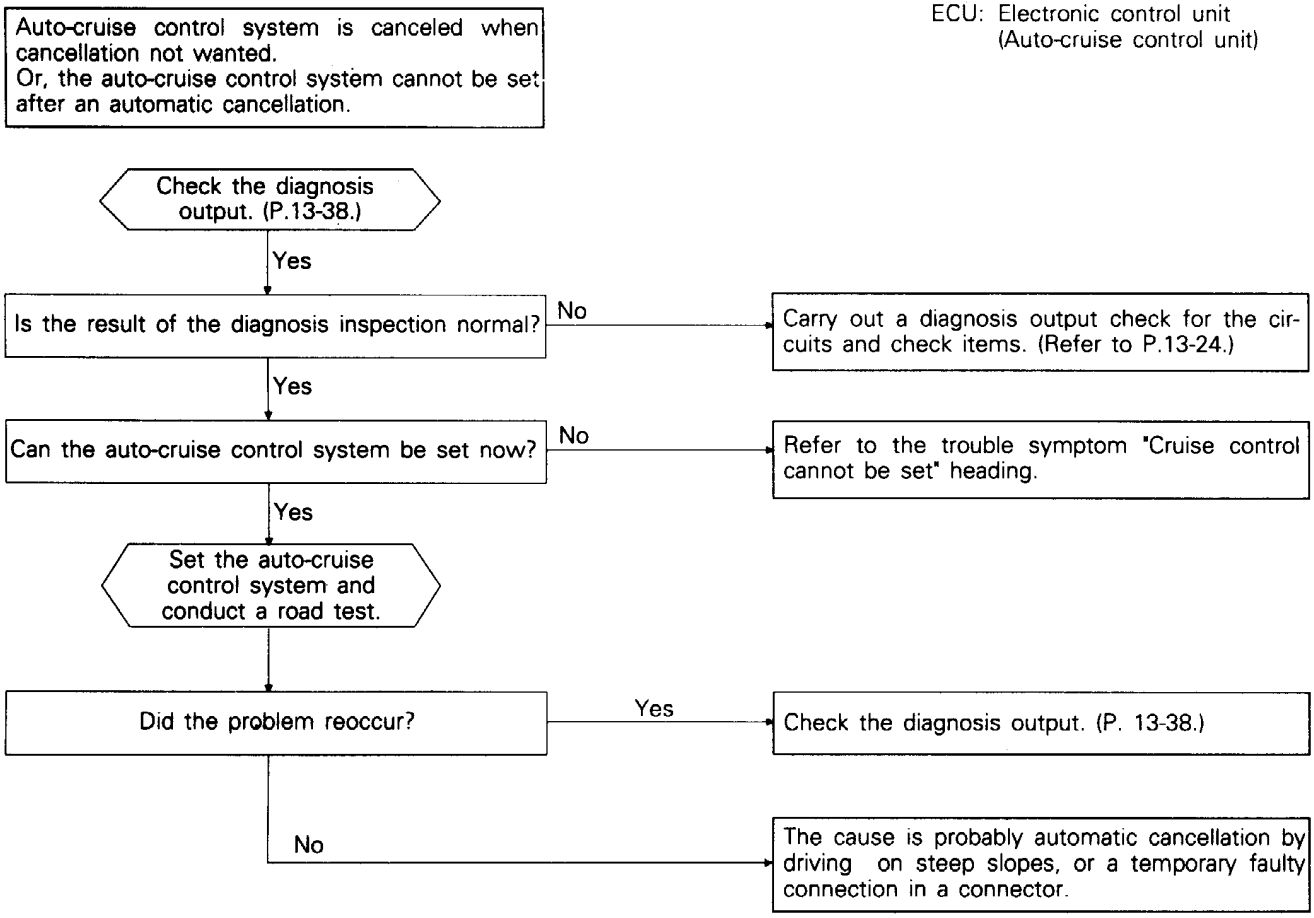
AUTO-CRUISE CONTROL SYSTEM

Before commencing troubleshooting, inspect each of the following sections, and if there is an abnormality, carry out a repair.

(1) Check if the installation and connection routes of the cables and vacuum hoses of the auto-cruise vacuum pump assembly, actuator and link assembly are all normal.
(2) Check if the link assembly and the movement of all cables are all working smoothly.
(3) Check if there is no excessive play or tension in each cable.

TROUBLESHOOTING QUICK-REFERENCE CHART

ECU: Electronic control unit
(Auto-cruise control unit)



Auto-cruise control system cannot be set.

NOTE
This chart is to used, then, for troubleshooting if it is not possible to use the self-diagnosis for checking.

Prepare to conduct input checking. (Refer to P.13-39.)

Are the results of all input checks normals?

Yes

No

Check results	Probable cause	Remedy	Reference page
Code 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch.	13-154
	SET switch input line short-circuit	Repair the harness.	13-25
Code 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.	13-154
	RESUME switch input line short-circuit	Repair the harness.	13-26
Code 23 is not canceled even if the stop lamp switch is turned OFF by releasing the brake pedal.	Malfunction of stop lamp switch circuit.	Replace stop lamp switch or repair harness.	13-13 13-154
Code 25 does not disappear, and code 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction of the vehicle speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	13-28
Code 26 is not canceled even if the clutch swithc is turned OFF by releasing the clutch pedal. <M/T>	Malfunction of clutch switch circuit.	Replace clutch switch or repair harness.	13-32 13-154
Code 26 is not canceled even if the selector lever is moved to anything but N, P <A/T>	Malfunction of inhibitor switch circuit.	Replace inhibitor switch or repair harness.	13-33 13-155
Code 27 remains even when the CANCEL switch is set to OFF.	Malfunction of CANCEL switch circuit	Replace the control switch or repair the harness.	13-27 13-154
Code 28 remains even when the accelerator pedal is released.	Malfunction of throttle position sensor circuit or accelerator position sensor circuit.	Replace the sensor or repair the harness.	13-36 13-37
Code 29 remains even when idle switch is set to ON.	Malfunction of idle switch circuit.	Replace the switch or repair the harness.	13-36 13-37

Check the auto-cruise vacuum pump circuit. (Refer to P.13-29.)

NOTE
If the results of the check of the auto-cruise vacuum pump circuit (Refer to P.13-29.) and of the auto-cruise vacuum pump and/or actuator themselves (Refer to P.13-155.) reveal no abnormal condition, replace the electronic control unit (ECU).

Trouble symptom	Probable cause	Check chart No.	Remedy
• The set vehicle speed varies gratly upward or downward. • "Hunching" (repeated alternating acceleration and deceleration) occurs after setting is made.	Malfunction of the vehicle speed sensor circuit	No. 5	Repair the vehicle speed sensor system, or replace the part.
	Malfunction of the speedometer cable or speedometer drive gear		
	Auto-cruise vacuum pump circuit poor contact	No. 6	Repair auto-cruise vacuum pump assembly or replace the part.
	Malfunction of the ECU	—	Replace the ECU.
The auto-cruise control system is not canceled when the brake pedal is depressed.	Damaged or disconnected wiring of the stop lamp switch input circuit: brake switch (for auto-cruise control) malfunction (short-circuit)	No. 7-1	Repair the harness or replace the stop lamp switch.
	Auto-cruise vacuum pump drive circuit short-circuit	No. 6	Repair the harness or replace the auto-cruise vacuum pump.
	Malfunction of the ECU	—	Replace the ECU.
The auto-cruise control system is not canceled when the clutch pedal is depressed. <M/T> (vehicles with a manual transmission) (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch switch input circuit	No. 7-2	Repair the harness, or repair or replace the clutch switch.
	Clutch switch improper installation (won't switch ON)		
	Malfunction of the ECU	—	Replace the ECU.

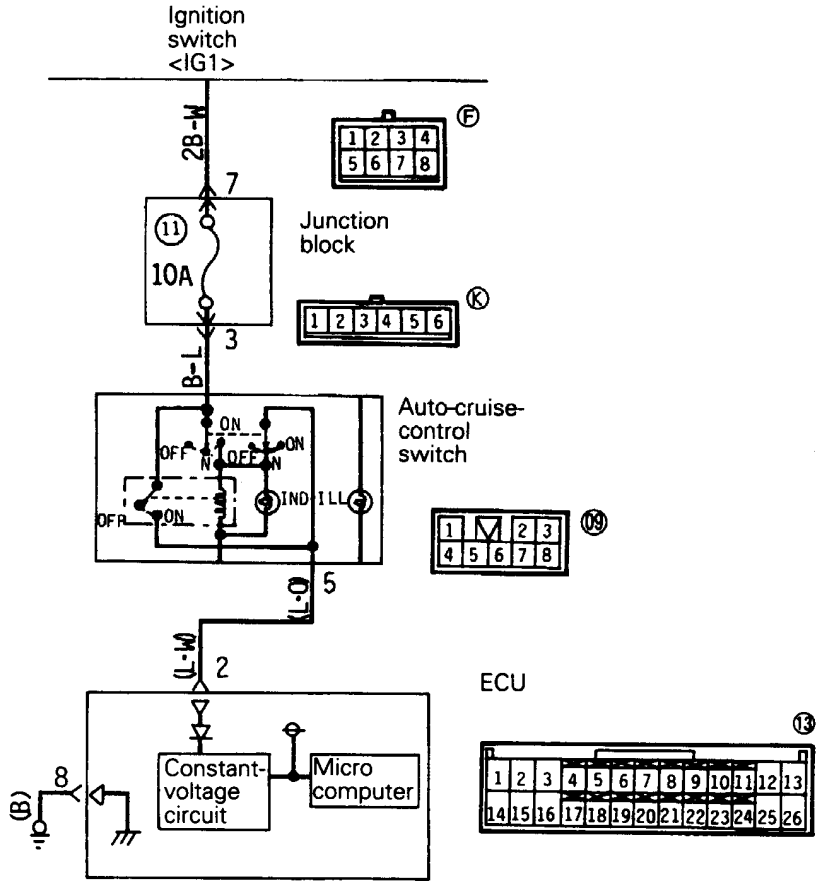
NOTE
ECU: Electronic control unit

Trouble symptom	Probable cause	Check chart No.	Remedy
The auto-cruise control system is not canceled when the selector lever is moved to the "N" position. <A/T> (Vehicles with an automatic transmission) (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of inhibitor switch input circuit	No. 7-3	Repair the harness, or repair or replace the clutch switch.
	Improper adjustment of inhibitor switch		
	Malfunction of the ECU	—	Replace the ECU.
Cannot decelerate by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	No. 2	Repair the harness or replace the auto-cruise control switch.
	Auto-cruise vacuum pump circuit poor contact	No. 6	Repair the harness or replace the auto-cruise vacuum pump.
	Malfunction of the vacuum pump assembly (including air leaks from negative pressure passage)		
	Malfunction of the ECU	—	Replace the ECU.
Cannot accelerate or resume speed by using the RESUME switch.	Damaged or disconnected wiring, or short-circuit, of RESUME switch input circuit	No. 3	Repair the harness or replace the auto-cruise control switch.
	Auto-cruise vacuum pump circuit poor contact	No. 6	Repair the harness or replace the auto-cruise vacuum pump.
	Malfunction of the vacuum pump assembly (including air leaks from negative pressure passage)		
	Malfunction of the ECU	—	Replace the ECU.
Cruise control does not cancel even when the CANCEL switch is set to ON. (However, it is cancelled when the brake pedal is depressed.)	Broken wire in the CANCEL switch circuit inside the control switch	No. 4	Repair the harness or replace the auto-cruise control switch.
	Malfunction of the ECU	—	Replace the ECU.

Trouble symptom	Probable cause	Check chart No.	Remedy
Auto-cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of the vehicle-speed sensor circuit	No. 5	Repaire the vehicle-speed sensor system, or repiace the part.
	Malfunction of the speedometer cable or the speedometer drive gear		
	Malfunction of the ECU	—	Replace the ECU.
The indicator lamp of the main switch does not illuminate. (But auto-cruise control system is normal.)	Damaged or disconnected bulb of indicator lamp Malfunction of the main switch	—	Repair the harness or replace the main switch.
	Harness damaged or disconnected		
Malfunction of control function by ON/OFF switching of ELC 4 A/T accelerator switch (Vehicles with A/T) (Non-operation of damper clutch, 2nd gear hold, etc.)	Malfunction of circuit related to accelerator switch OFF function	No. 8	Repair the harness or replace the part.
	Malfunction of the ECU		Replace the ECU.
Overdrive is not canceled during fixed speed driving. (Vehicles with A/T)	Malfunction of circuit related to overdrive cancelation, or malfunction of ECU	No. 9	Repair the harness or replace the part.
No shift to overdrive during manual driving. (Vehicles with A/T)			

CHECK CHART

1. CHECKING THE CONTROL UNIT POWER SUPPLY CIRCUIT



NOTE
(1) The alphanumeric characters on the side of the connector correspond to those on P.13-41.
(2) ECU: Electronic control unit (Auto-cruise control unit)

03N0094

Description of operation

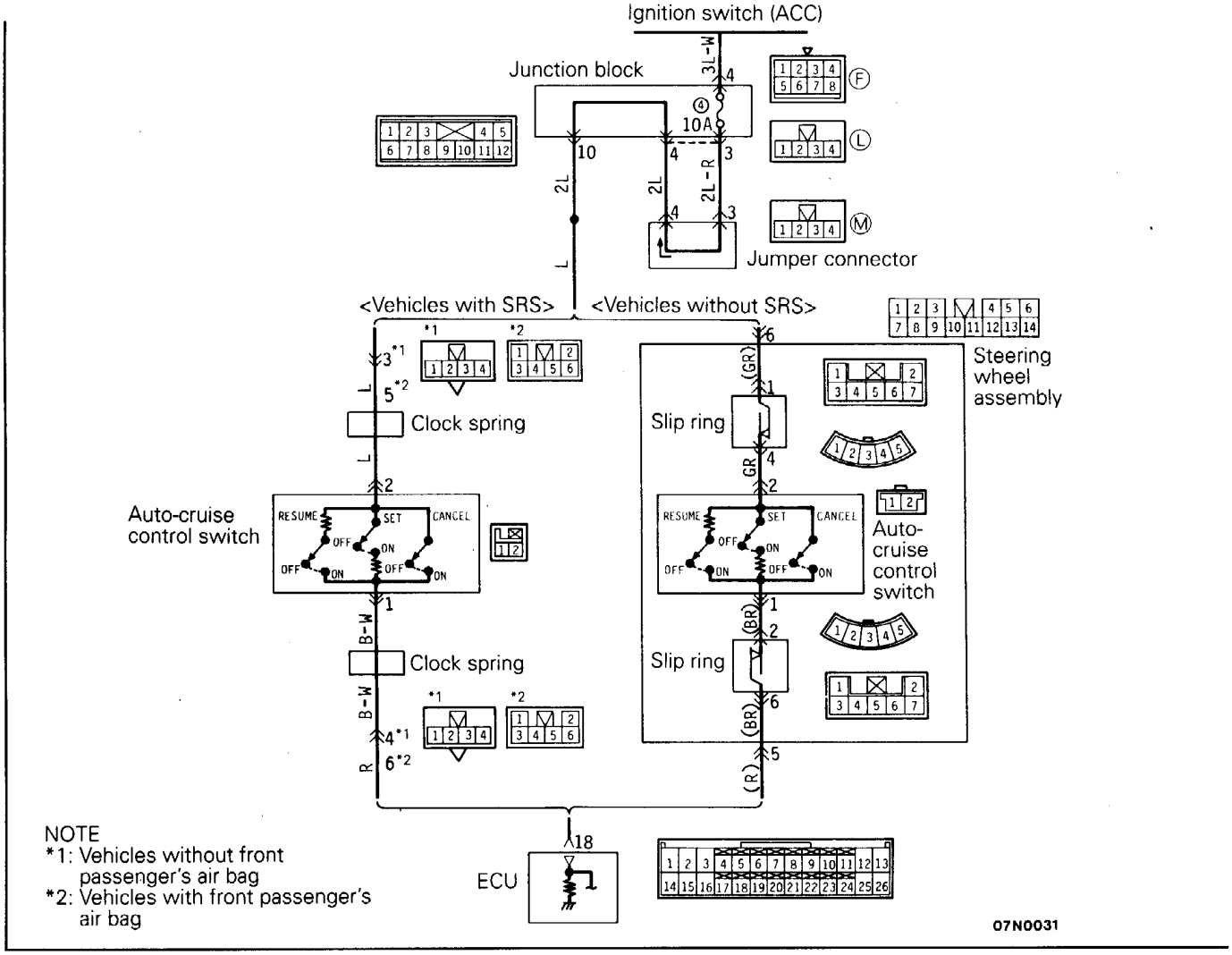
When the auto-cruise-control main switch is switched ON while the ignition switch is ON, current flows to the ignition switch (IG1), to fuse No. 11 of the junction block, and to the auto-cruise-control main switch, the control unit, and to earth. When the ignition switch is turned off, the cruise control switch is also turned off.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
2	Control unit power supply	When the auto-cruise-control switch ("MAIN") is switched ON	System voltage
8	Control unit earth	At all times	0V

2. CHECKING THE SET SWITCH CIRCUIT



Description of operation

When the SET switch is switched ON (at the vehicle speed desired to be maintained, and with the main switch of the cruise-control switches ON) that vehicle speed is maintained as a constant speed.
Furthemore, the constant speed is gradually reduced (the "coasting" feature) when the SET switch is switched ON and held while the vehicle is traveling at the previously set constant speed, and, when the SET switch is switched OFF, the vehicle then maintains that newly set constant speed (the speed at which the SET switch was switched OFF).
Current flows to the junction block fuse No. (4) and to the engine compartment jumper connector. It then returns to the junction block and flows to the auto-cruise control switch (SET switch) and to the auto-cruise control unit.

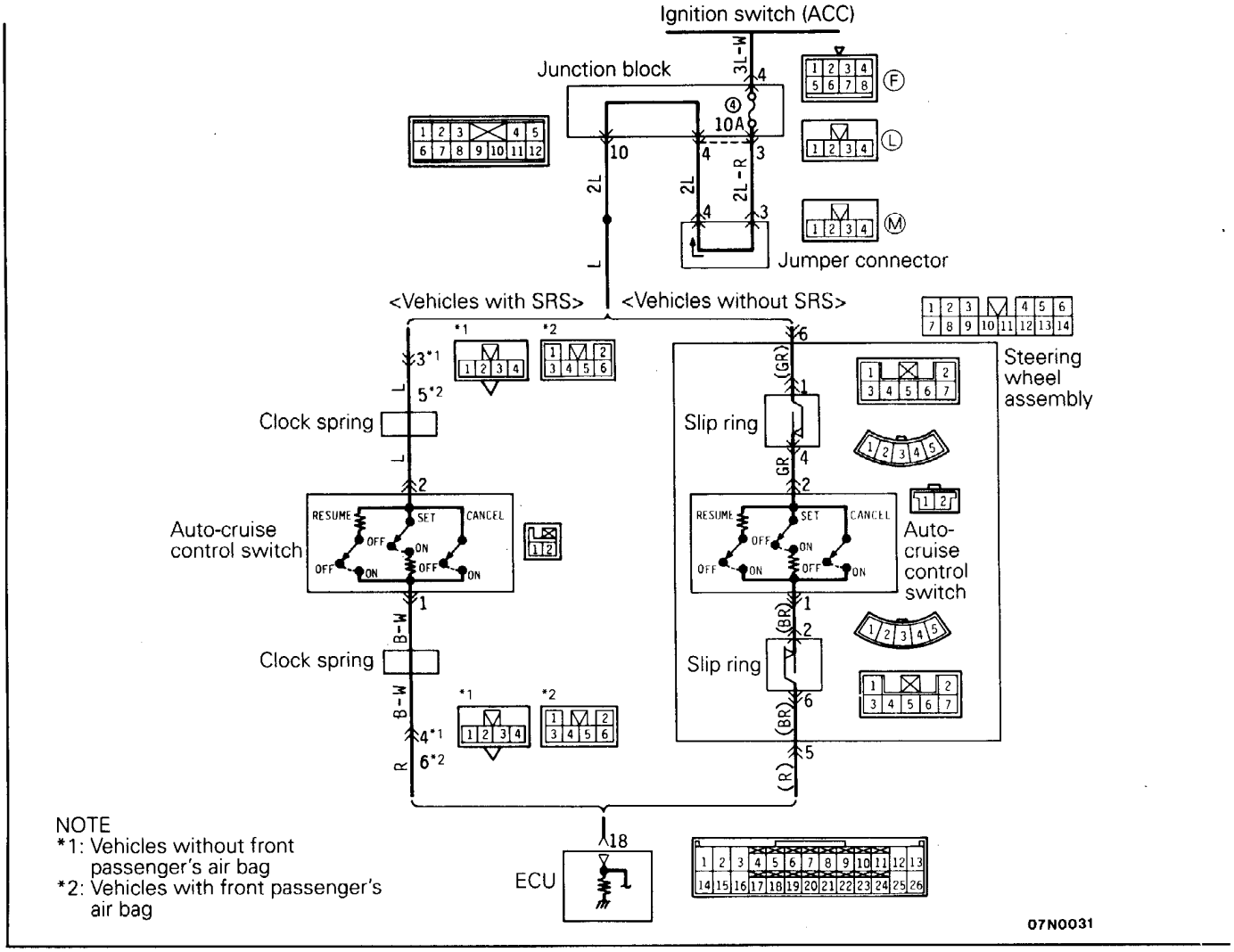
Troubleshooting hint

Diagnosis – No. 15 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
18	SET switch	When the SET switch is switched ON	3V
		When the SET switch is swiched OFF	0V

3. CHECKING THE RESUME SWITCH CIRCUIT



Description of operation

The set speed (before cancellation) resumes when the RESUME switch is switched ON, even if the constant-speed control has been cancelled. That speed will not resume, however, even if the "RESUME" switch is switched ON, if the auto-cruise main switch is switched OFF and if the vehicle speed decreases to 40 km/h (25 mph) or lower.

In addition when the RESUME is switched ON and held while the vehicle is traveling at a constant speed the vehicle speed will increase the speed at which the switch is subsequently switched OFF will become the newly set constant speed.

Current flows to the junction block fuse no. (4) and to the engine compartment jumper connector. It then returns to the junction block and flows to the auto-cruise control switch (RESUME switch) and to the auto-cruise control unit.

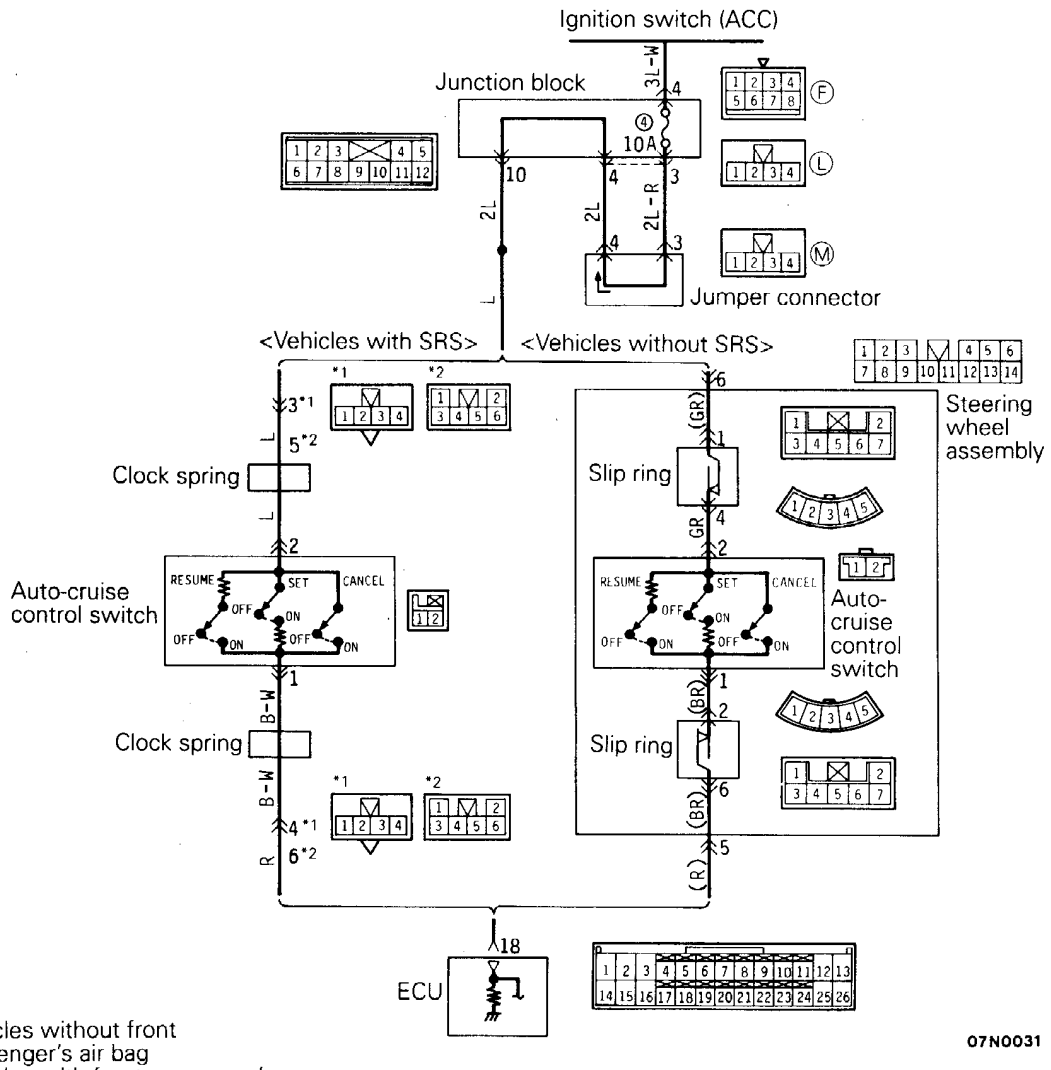
Troubleshooting hint

Diagnosis – No. 5 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
18	RESUME switch	When the RESUME switch is switched ON	6V
		When the RESUME switch is switched OFF	0V

4. CHECKING THE CANCEL SWITCH CIRCUIT



NOTE
*1: Vehicles without front passenger's air bag
*2: Vehicles with front passenger's air bag

Description of operation

By turning the CANCEL switch to ON during cruise control, the cancel signal is sent to the auto-cruise control unit. Power to the auto-cruise vacuum pump assembly inside the control unit is stopped, and cruise control is cancelled. Current flows to the junction block fuse No. (4) and to the engine compartment jumper connector. It then returns to the junction block and flows to the auto-cruise control switch (CANCEL switch) and to the auto-cruise control unit.

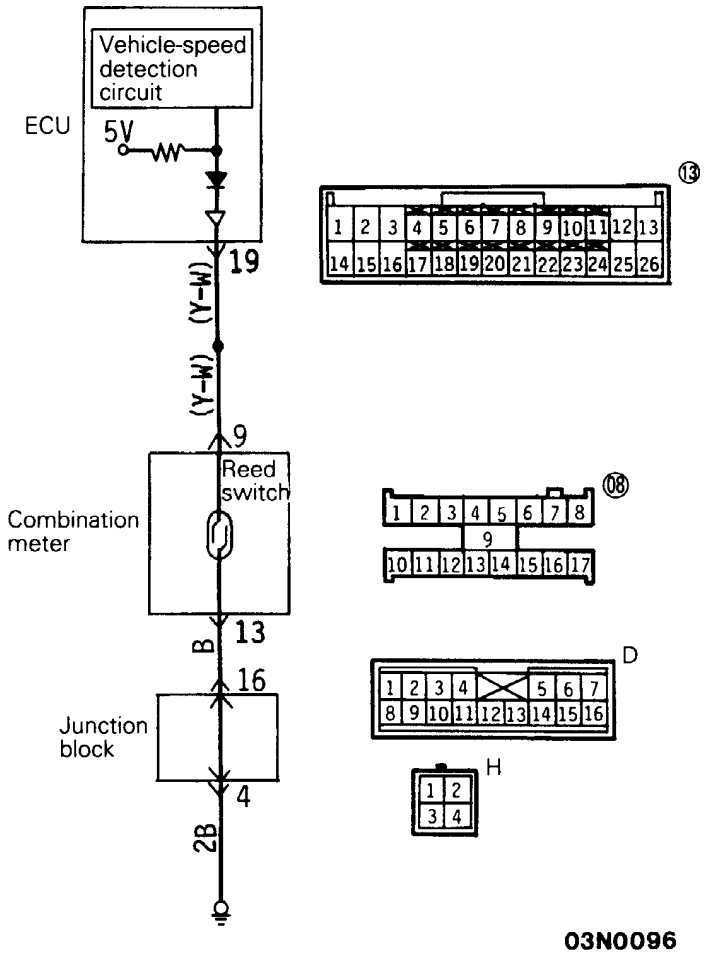
Troubleshooting hint

Diagnosis – No. 15 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
18	CANCEL switch	When the CANCEL switch is switched ON	System voltage
		When the CANCEL switch is switched OFF	0V

5. CHECKING THE VEHICLE-SPEED SENSOR CIRCUIT



Description of operation

The vehicle-speed sensor is installed within the speedometer; it sends to the control unit pulse signals that are proportional to the rotation speed (i.e., the vehicle speed) of the transmission's output gear.
This vehicle-speed sensor is the reed switch type of sensor; it generates four pulse signals for each rotation of the speedometer's driven gear.

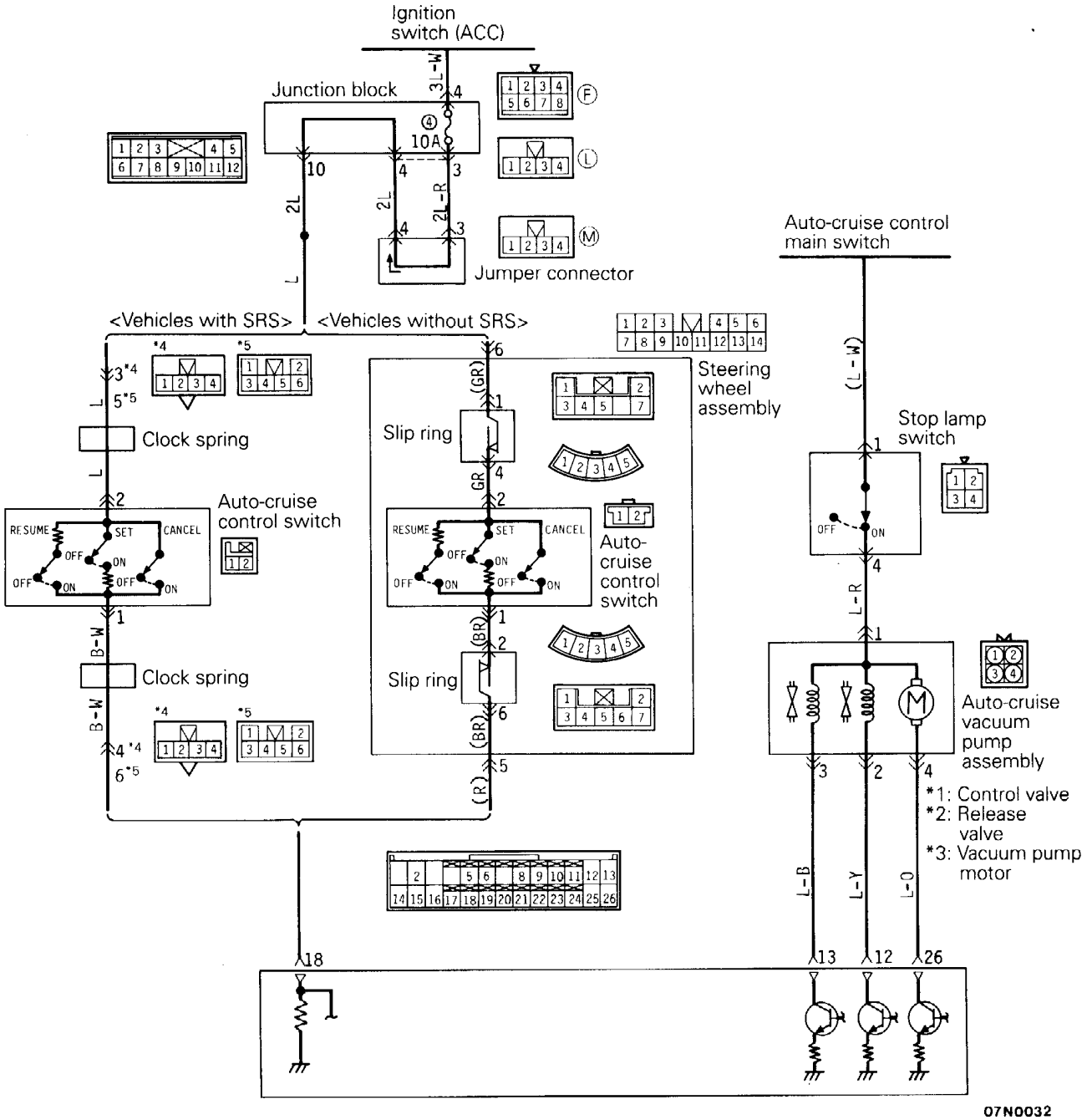
Troubleshooting hint

Diagnosis – No. 12 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
19	Vehicle-speed sensor	Move the select lever to the range "D" or "1" and slowly start driving.	0V–0.6V ← Flashing → 2V or higher

6. CHECKING THE AUTO-CRUISE VACUUM PUMP CIRCUIT



NOTE
*4: Vehicles without front passenger's air bag
*5: Vehicles with front passenger's air bag

Description of operation

Hold Mode
If the SET switch is turned ON when the main switch is turned to ON and the vehicle speed is 40 km/h (25 mph) or higher, the control unit receives a set signal, and current to the electric vacuum pump is stopped, and current flows to the control and release valve solenoid coils, closing both valves together. After the constant speed is reached, the motor and control valve and release valve are repeatedly turned and ON and OFF according to driving conditions.

Acceleration Mode
When the RESUME switch is switched ON, the control unit receives a RESUME signal and it not only turns the auto-cruise vacuum pump motor ON but also turns the control valve and release valve ON (valve is closed).

Deceleration Mode
When the SET switch is switched ON, the control unit receives a set signal and it not only turns the auto-cruise vacuum pump motor control valve OFF (valve is opened) but also turns the release valve ON (valve is closed).

Release Mode
When the CANCEL switch is switched ON, the control unit receives a cancel signal and it not only turns the auto-cruise vacuum pump motor OFF but also turns the control valve and release valve OFF (valve is opened).

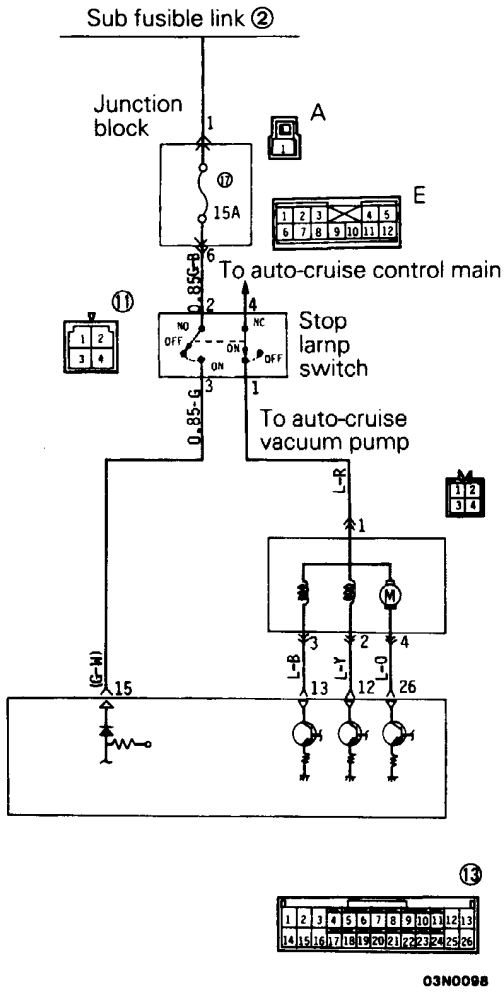
Troubleshooting hint

Diagnosis – No. 11 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Mode/Terminal voltage (V)			
		Hold	Acceleration	Deceleration	Release
26	Auto-cruise vacuum pump drive	System voltage	0	System voltage	System voltage
13	Control valve open/close	0	0	System voltage	System voltage
12	Release valve open/close	0	0	0	System voltage

7-1. CHECKING THE STOP LAMP SWITCH CIRCUIT



NOTE
(1) NC: ON at all times
(2) NO: OFF at all times

Description of operation

When the brake pedal is depressed during constant-speed travel, the stop lamp switch's (NC) contacts for the cruise-control system open, with the result that the current to the auto-cruise vacuum pump is interrupted, thus cancelling the constant-speed travel.

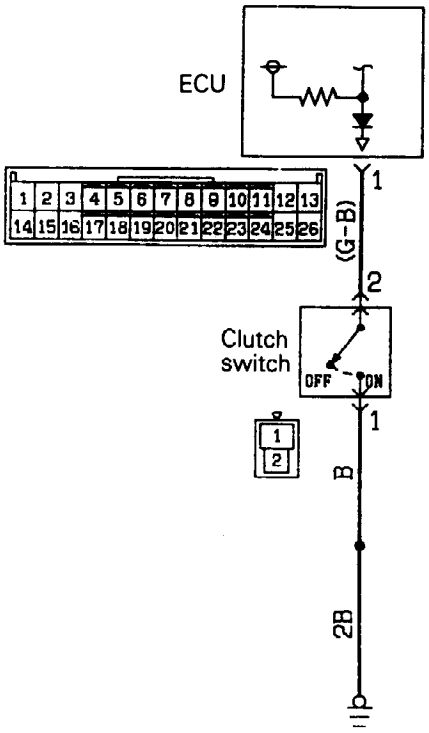
At the same time, moreover, the closing of the (NO) contacts for the stop lamp results in the sending of the cencel signal to the control unit, so that the auto-cruise vacuum pump current is discontinued within the control unit, thereby canceling the constant-speed travel.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
15	Stop lamp switch	When the brake pedal is depressed	System voltage
		When the brake pedal is not depressed	0V

7-2. CHECKING THE CLUTCH SWITCH CIRCUIT <M/T models>



KX33-AK-R1307A

Description of operation

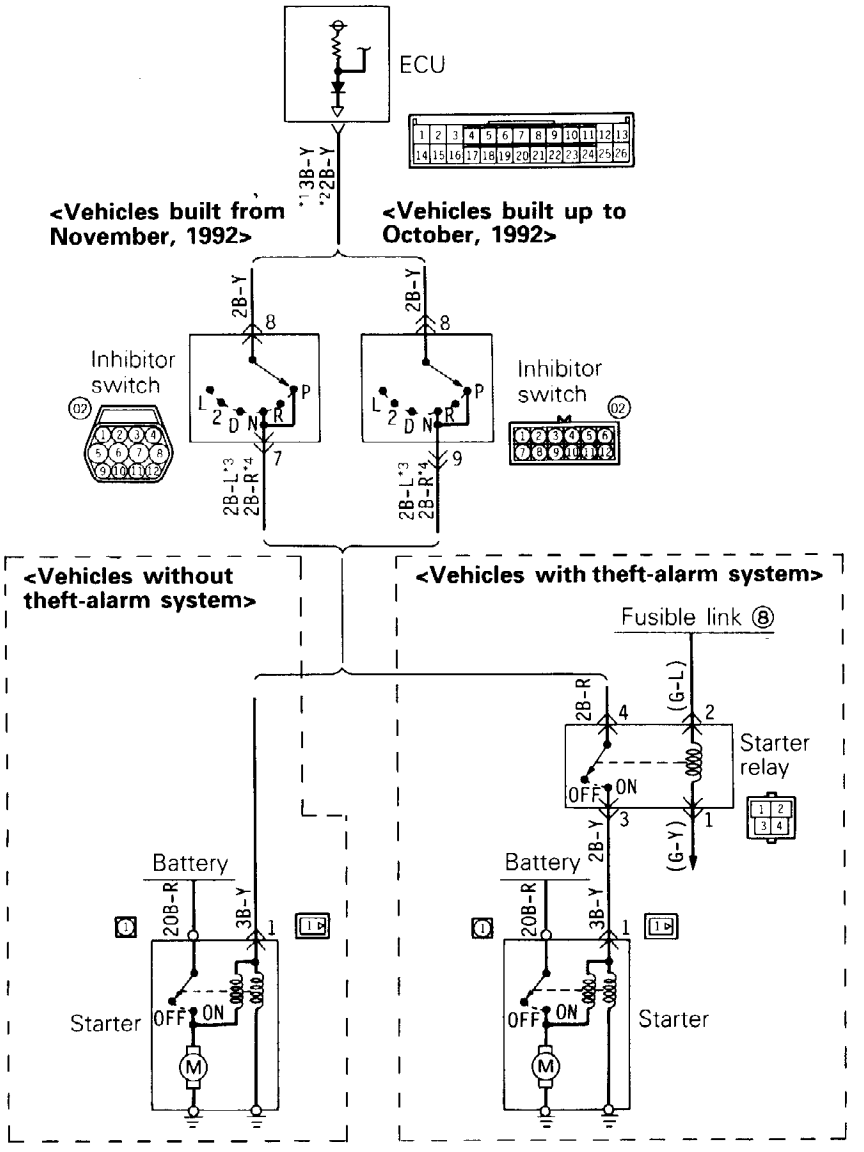
If the clutch pedal is pressed when driving at a constant speed, the clutch switch is turned ON and a cancel signal is input to the control unit. This causes the vacuum pump assembly drive circuit inside the control unit to be isolated, and cruise control is cancelled.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	.Terminal voltage
1	Clutch switch	When the clutch pedal is depressed	0V
		When the clutch pedal is not depressed	5V

7-3. CHECKING THE INHIBITOR SWITCH CIRCUIT <A/T models>



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles
*3: Vehicles with theft-alarm system
*4: Vehicles without theft-alarm system

03N0145

Description of operation

The inhibitor switch also functions as the switch for the starter.
If the selector lever is moved to the "N" position during constant-speed travel, current flows to the control unit, inhibitor switch, starter motor, and to earth; the cancel signal is therefore input to the control unit, thus canceling the constant-speed travel.

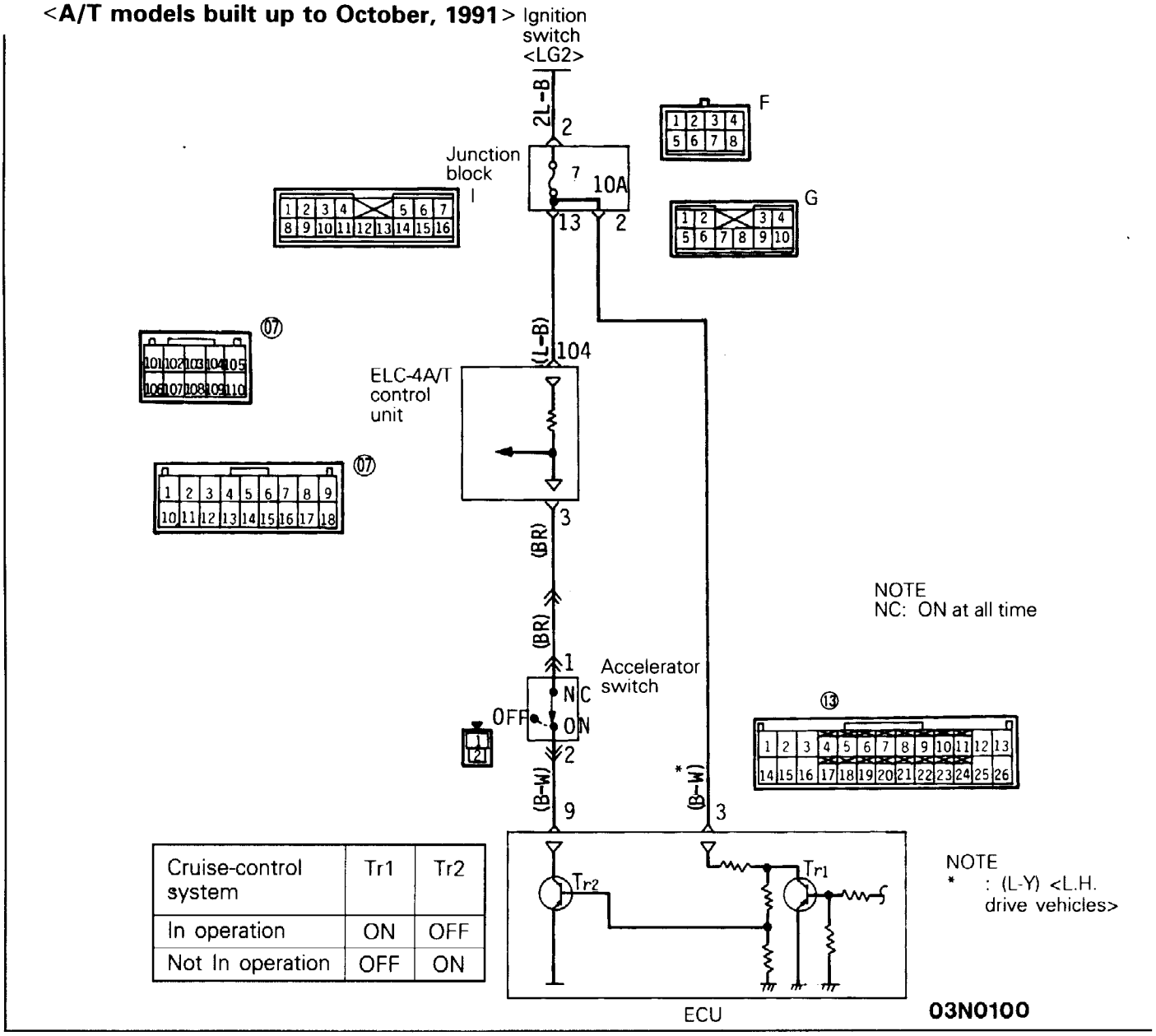
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
1	Inhibitor switch	Neutral	0V

8. CHECKING THE CIRCUITS RELATED TO THE ACCELERATOR SWITCH OFF FUNCTION

<A/T models built up to October, 1991>



Cruise-control system	Tr1	Tr2
In operation	ON	OFF
Not In operation	OFF	ON

Description of operation

The accelerator switch is a switch that detects the operational status of the accelerator pedal; it is one of the sensors of the ELC automatic transmission.

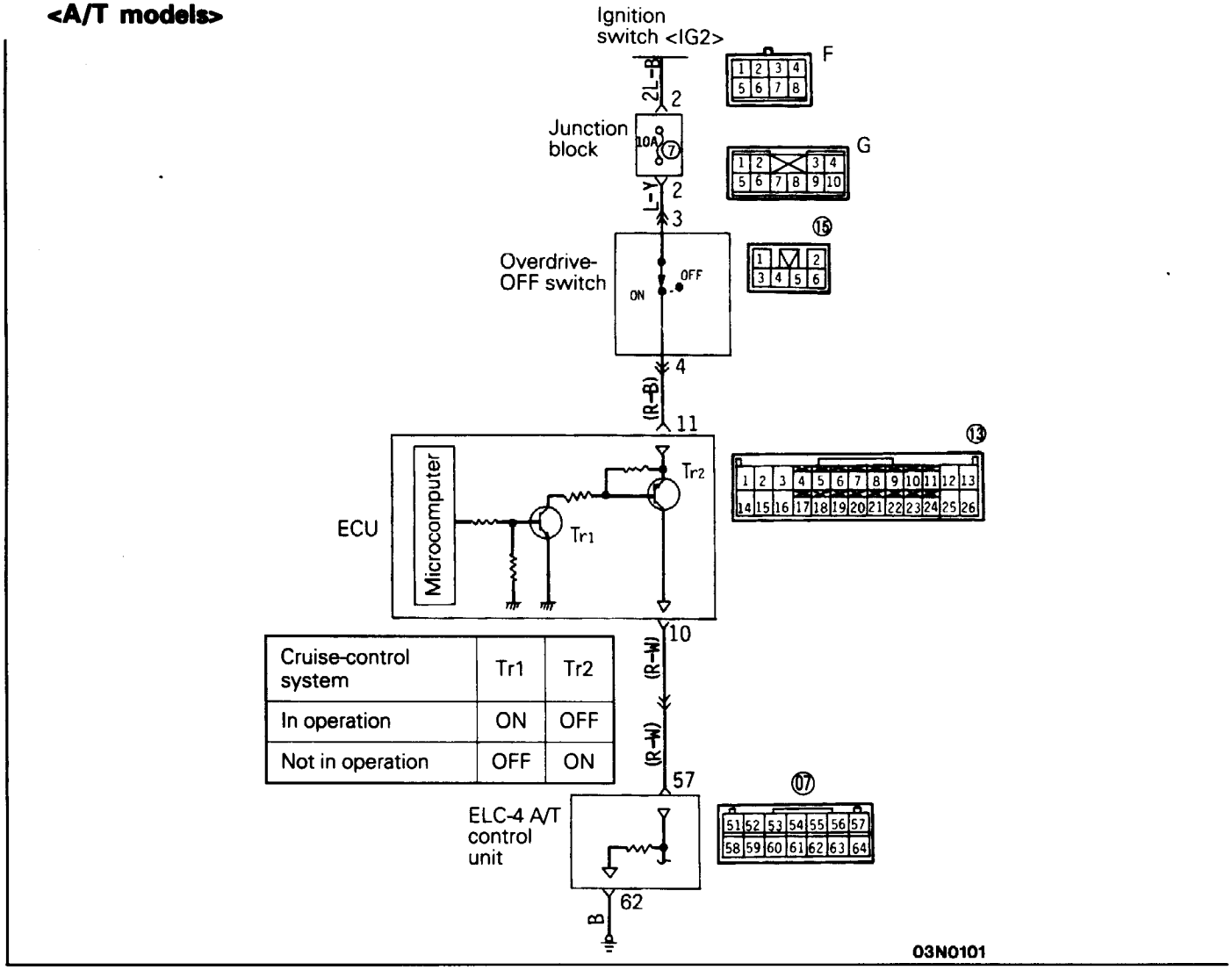
Because the status of the accelerator pedal during constant-speed driving is non-operational, the earth circuit (transistor Tr2) of the accelerator switch is switched OFF only during constant-speed driving.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions		Terminal voltage
3	Control unit power supply	At all times		System voltage
9	Accelerator switch	When the accelerator pedal is depressed		0V
		When the accelerator pedal is not depressed	During constant-speed driving	System voltage
			During idling	0V

9. CHECKING THE CIRCUIT RELATED TO THE OVERDRIVE-CANCELLATION FUNCTION <A/T models>



Cruise-control system	Tr1	Tr2
In operation	ON	OFF
Not in operation	OFF	ON

Description of operation

This is a function that cancels the overdrive function for a certain fixed period of time, if during constant-speed travel in overdrive, the actual vehicle speed decreases to less than the vehicle speed retained in the memory, and then after a short time causes the vehicle speed to return to the vehicle speed retained in the memory.
The overdrive function is cancelled in the following cases.
(1) When resume switch is ON.
(2) When actual vehicle speed drops 7 km/h (4mph) or more below the set vehicle speed during cruise control.

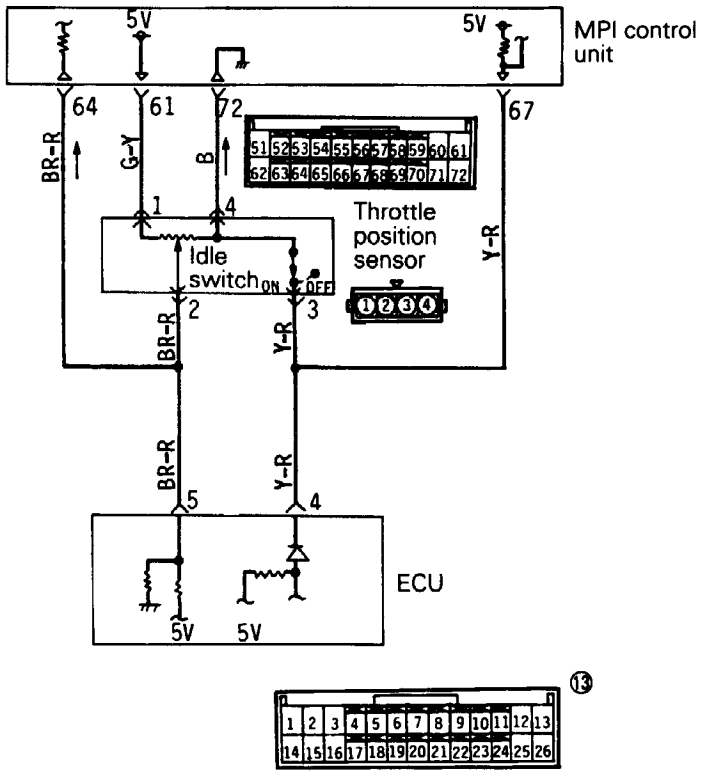
Under the conditions described above, the overdrive ON signals output from the microcomputer (within the cruise control unit) are no longer output, and transistor Tr1 is switched OFF.
As a result, transistor Tr2 is also switched OFF, causing the current passing through the overdrive-OFF switch of the selector lever to be interrupted at transistor Tr2, with the result that the drive is controlled at 3rd gear.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
10	ELC-4 A/T control unit	When the overdrive-OFF Switch is switched ON	System voltage
11	Overdrive-OFF switch	When the overdrive-OFF switch is switched ON	System voltage

10. CHECKING THE THROTTLE POSITION SENSOR AND IDLE SWITCH CIRCUIT <VEHICLES WITHOUT TCL>



03N0102

Description of operation

The throttle position sensor (TPS) converts the opening degree of the throttle valve to a voltage value, and inputs this to the control unit. The control unit compares this signal to the vehicle speed signal, and changes the amount of the actuator operation. The idle switch standardizes the TPS voltage value when the switch turns from ON to OFF and corrects the movement and distribution of the TPS voltage.

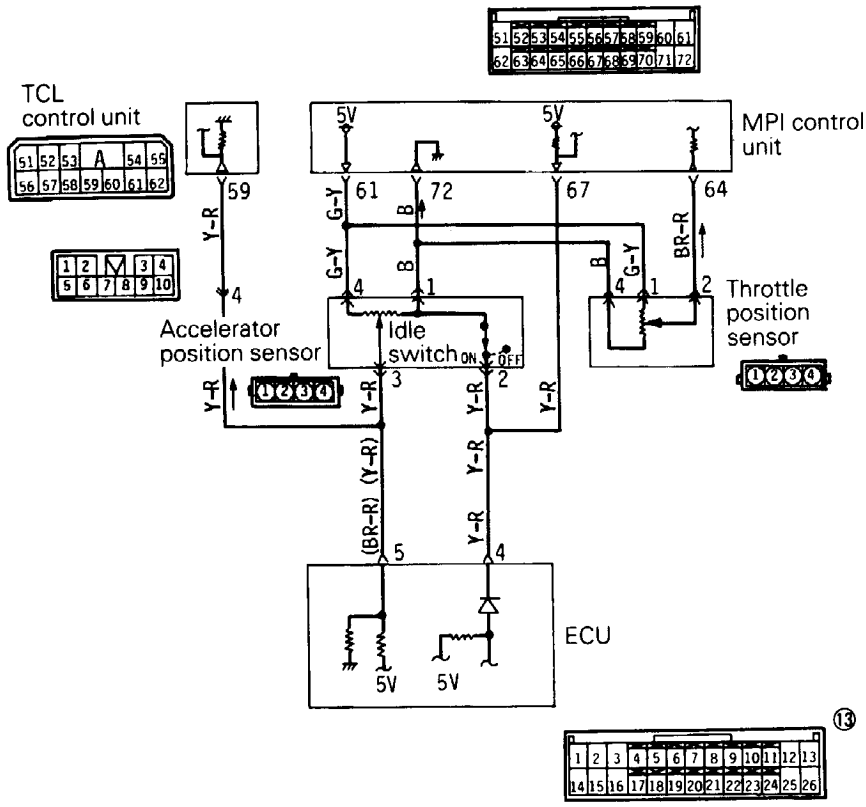
Troubleshooting hint

Diagnosis – No. 17 (automatically cancelled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
4	Idle switch	When accelerator pedal is pressed	4.5V–5.5V
		When accelerator pedal is released	0V
5	Throttle position sensor	When accelerator pedal is pressed all the way down	4.0V–5.5V
		When accelerator pedal is released	0.5V–0.7V

11. CHECKING THE ACCELERATOR POSITION SENSOR AND IDLE SWITCH CIRCUIT <VEHICLES WITH TCL>



03N0103

Description of operation

The accelerator position sensor converts the opening degree of the throttle valve (equivalent to the amount of the accelerator pedal depression), to a voltage value and inputs this to the control unit. The control unit compares this signal to the vehicle speed signal, and changes the amount of the actuator operation. (Furthermore, the traction control unit performs traction control based on this signal.) The idle switch standardizes the TPS voltage value when the switch turns from ON to OFF and corrects the movement and distribution of the TPS voltage.

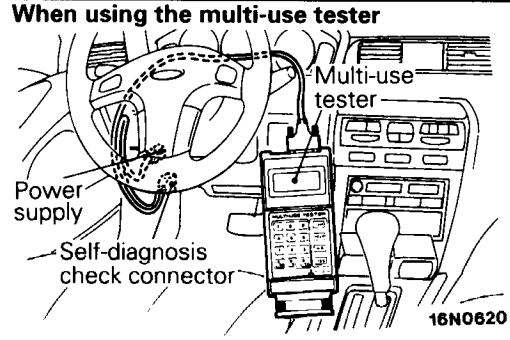
Troubleshooting hint

Diagnosis – No. 17 (automatically cancelled)

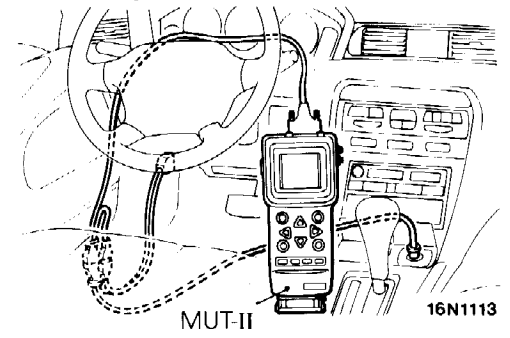
ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal voltage
4	Idle switch	When accelerator pedal is pressed	4.5V–5.5V
		When accelerator pedal is released	0V
5	Accelerator position sensor	When accelerator pedal is pressed all the way down	4.0V–5.5V
		When accelerator pedal is released	0.5V–0.7V

When using the multi-use tester



When using the MUT-II



SELF-DIAGNOSIS CHECKING

Self-diagnosis checking is performed when there has been an automatic cancellation, without cancel switch operation.

(1) Connect the diagnosis check connector from the junction box to a multi-use tester <Up to 1993 models> or MUT-II <All models>.

Caution
The ignition switch should always be turned OFF when connecting and disconnecting the multi-use tester or MUT-II.

(2) The cause of the cancellation can be determined in each system by comparing the output code read with those in the following table.

(3) When a diagnosis code no. is displayed, inspect by referring to the relevant inspection chart no. for each respective code.

NOTE
All diagnosis codes are stored so that it is possible to check if a problem occurred in the past or not until disconnecting the battery terminals, even when the ignition key is turned to OFF.

Also, the diagnosis codes can be erased by the following procedure.

(1) Turn on ignition switch.
(2) Turn on main switch with SET switch "ON" and then turn on RESUME switch within one second.
(3) Turn on SET switch and stop lamp switch simultaneously and keep this condition for more than 5 seconds.
(4) Turn the main switch OFF and then turn the switch ON, and inspect the self-diagnosis code to check if a normal code is output or not.

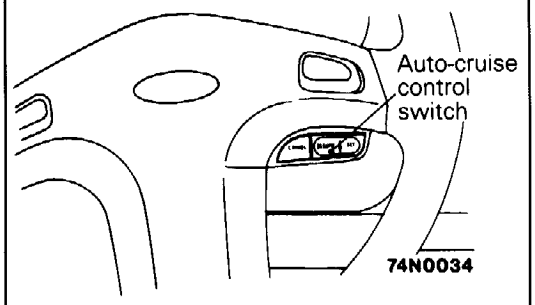
DIAGNOSIS DISPLAY PATTERNS AND CODES

Code No.	Probable cause	Check chart No.
11	Abnormal condition of auto-cruise vacuum pump drive system	No. 6
12	Abnormal condition of vehicle-speed signal system	No. 5
15	Control switch malfunction (when SET and RESUME switches switched ON simultaneously for 60 seconds or more)	No. 2, 3
16	Abnormal condition of ECU	—
17	Abnormal condition of throttle position sensor or accelerator position sensor Abnormal condition of idle switch	No. 10, 11

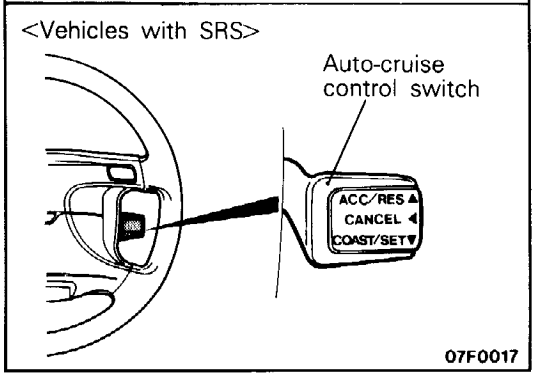
NOTE
(1) These codes are displayed when the main switch is ON and the vehicle is not moving at constant speed.

(2) Diagnosis codes are displayed when, after cancellation of the auto-cruise control system, the vehicle speed decreases to less than approximately 20 km/h (12 mph), and erased by battery "OFF" or erasure of diagnosis codes. (Refer to P.13-38.)
After the diagnosis codes in the memory are erased, if (when the power supply of the electronic control unit is switched ON once again) the power supply of the electronic control unit is normal, the diagnosis output code will be displayed, regardless of whether the system condition is normal or not.

<Vehicles without SRS>



<Vehicles with SRS>

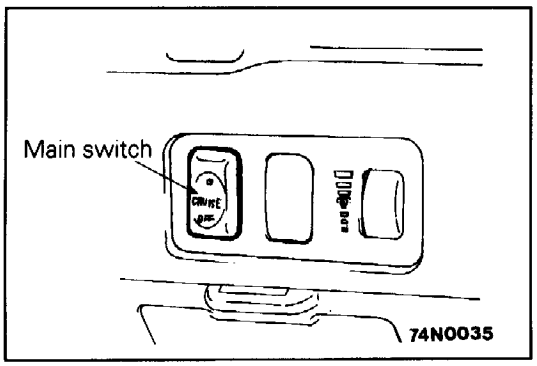


INPUT CHECKING

Input checks should be made when the auto-cruise control system cannot be set and when it is necessary to check (when a malfunction related to the auto-cruise control system occurs) whether or not the input signals are normal.

NOTE
(1) Input checking can be done during regular operation, and the terminal is the self-diagnosis terminal.
(2) Display codes are displayed only if the circuit is normal according to the conditions shown in the table on the next page.

Check according to the following procedure.
(1) Connect the diagnosis check connector from the junction box to a multi-use tester <Up to 1993 models> or MUT-II <All models>.



(2) Generating the codes
① Turn the ignition switch to ON.
② With the SET switch ON, switch ON the main switch, and then, within one second, switch ON the RESUME switch.

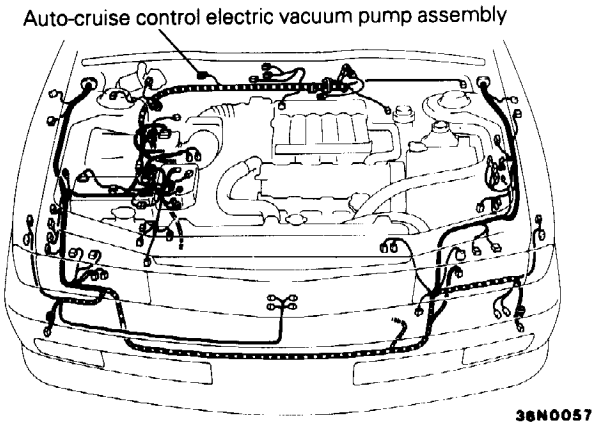
(3) Reading the codes
① Carry out each input operation as shown in the input check table (refer to P.13-40), and read the codes.
NOTE
(1) When two or more input operations are conducted at the same time, each code will be output in order, starting from the smallest code number.
(2) Each code is displayed in order priority from code 21. If nothing is displayed, the control unit power circuit or the SET or RESUME switches are probably faulty, so check inspection charts 1, 2 and 3.

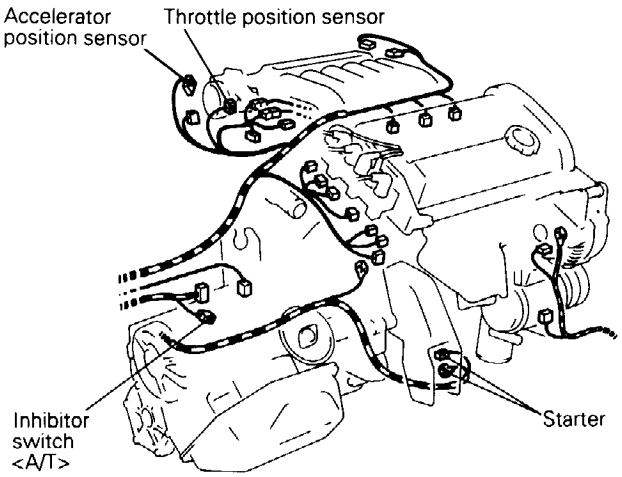
INPUT CHECK TABLE

Code No.	Input operation	Check results
21	SET switch ON	SET switch circuit normal
22	RESUME switch ON	RESUME switch circuit normal
23	Stop lamp switch (brake pedal depressed)	Stop lamp switch circuit normal
24	Driving at approximately to 40 km/h (25 mph) or higher	When both No. 24 and No. 25 can be confirmed, vehicle-speed sensor circuit normal.
25	Driving at less than approximately 40 km/h (25 mph) or stopped	
26	1. Clutch switch ON (clutch pedal depressed) <M/T> 2. Inhibitor switch ON (selector lever to "N" or "P" range) <A/T>	Inhibitor switch or clutch switch circuit normal
27	CANCEL switch ON	CANCEL switch circuit normal
28	Throttle position sensor (when the accelerator pedal is pressed more than half way)	Throttle position sensor circuit normal
29	Idle switch OFF (accelerator pedal depressed)	Idle switch circuit normal

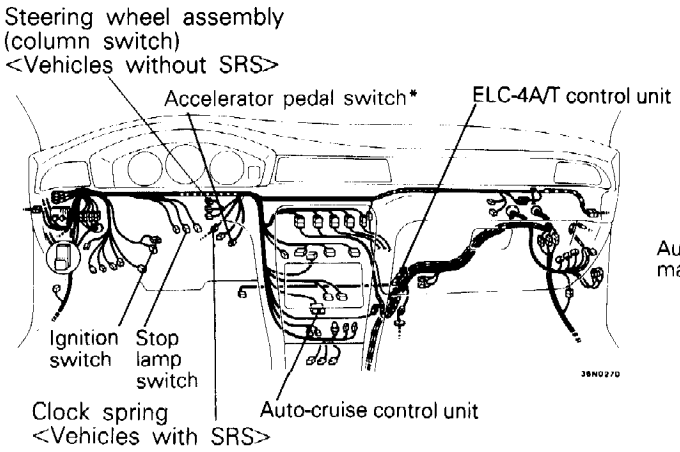
Harness and component placement diagram

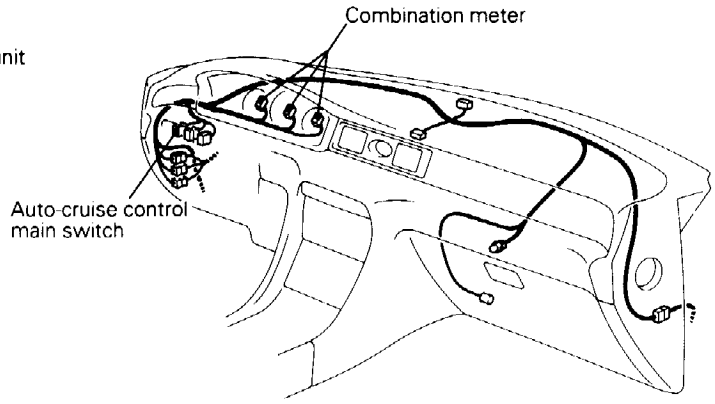
<Engine room>

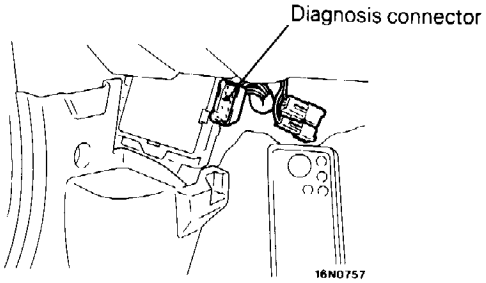


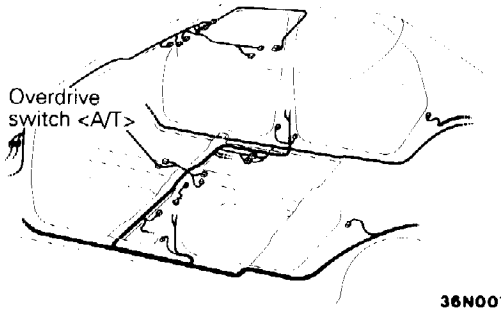


<Inside passenger compartment>



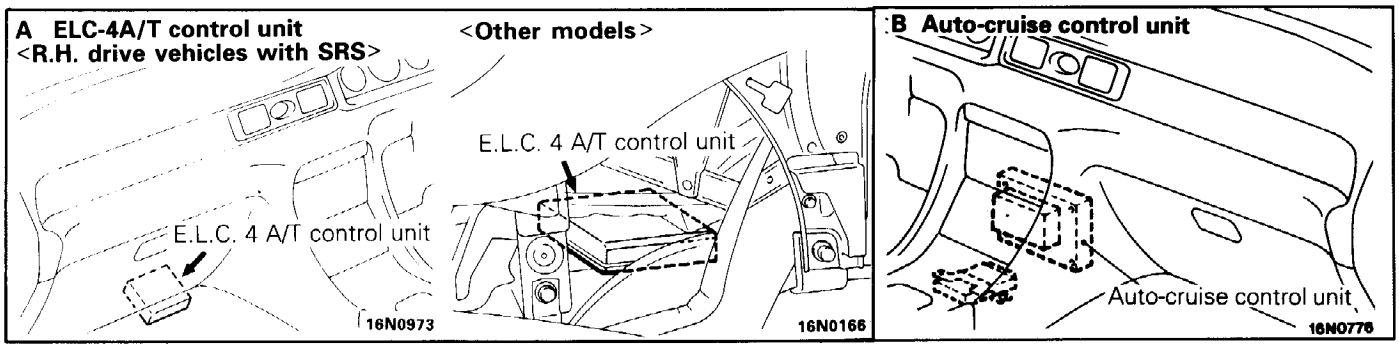




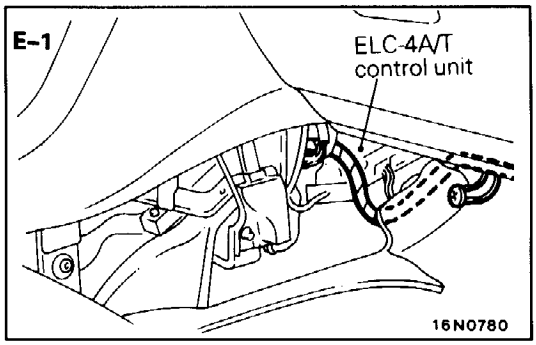


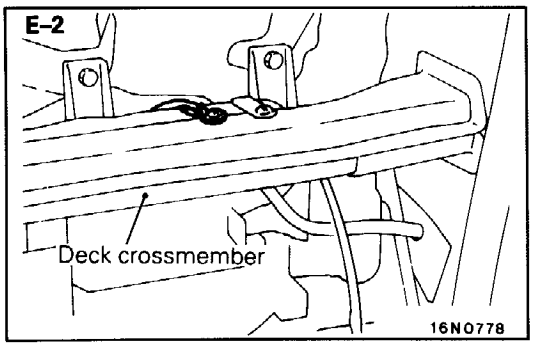
NOTE
*: <A/T models built up to October, 1991>

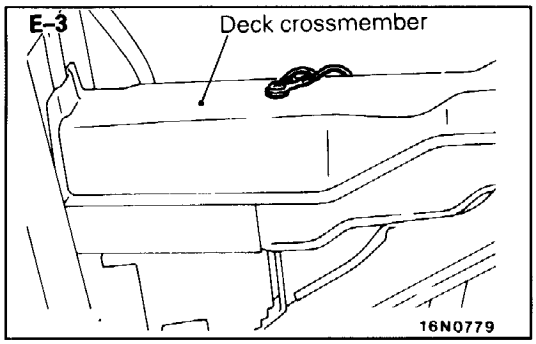
Control unit placement diagram



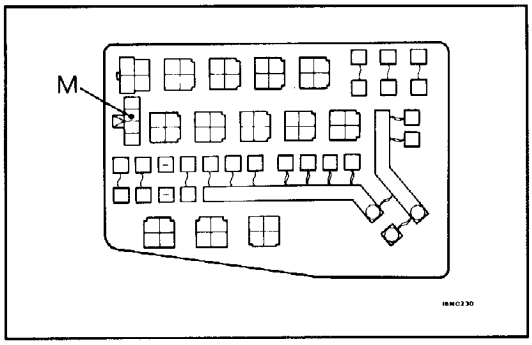
Earth point





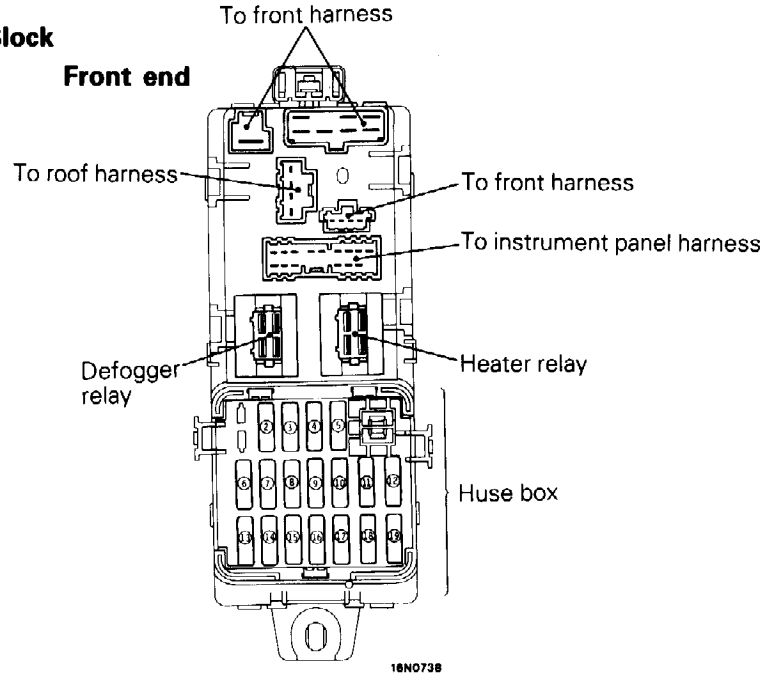


Relay box in engine room

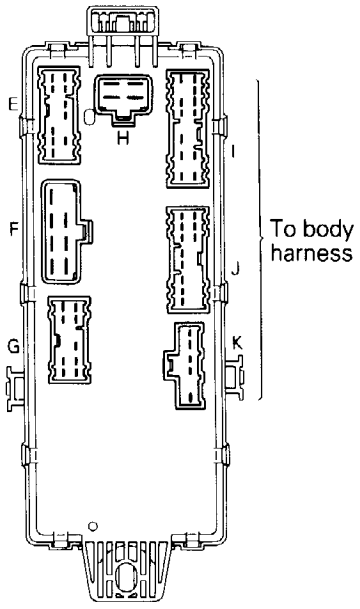


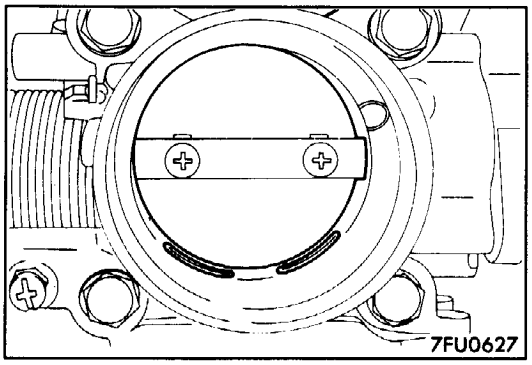
Junction Block

Front end



Rear end





SERVICE ADJUSTMENT PROCEDURES <ENGINE>

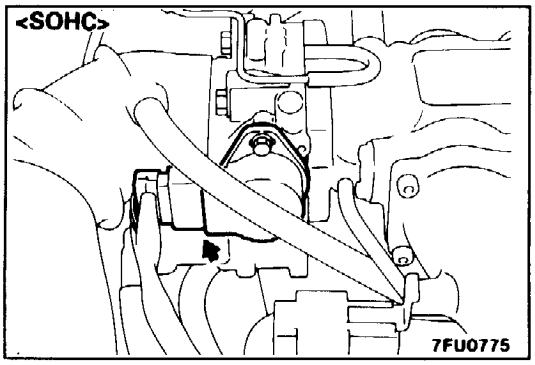
THROTTLE BODY (THROTTLE VALVE AREA) CLEANING E13HAJA

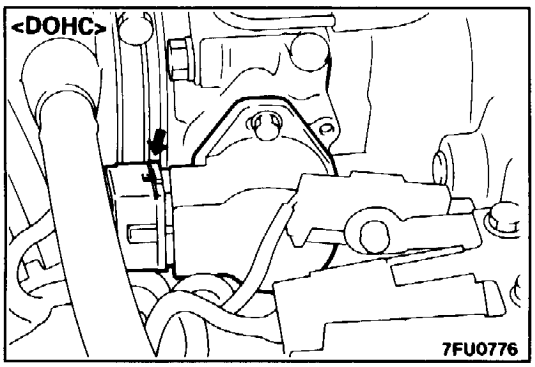
(1) Start the engine and warm it up until the temperature of the engine coolant reaches 80°C (176°F) or higher; then stop the engine.
(2) Remove the air intake hose from the throttle body.
(3) Plug the bypass passage inlet of the throttle body.

Caution
Do not allow cleaning solvent to enter the bypass passage.

(4) Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
(5) Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls), slightly open the throttle valve to keep the engine running.
(6) If the throttle valve deposits are not removed, repeat steps (4) and (5).
(7) Unplug the bypass passage inlet.
(8) Attach the air intake hose.
(9) Use the multi-use tester to erase the self-diagnosis code.
(10) Adjust the basic idle speed. (Refer to P.13-47.)

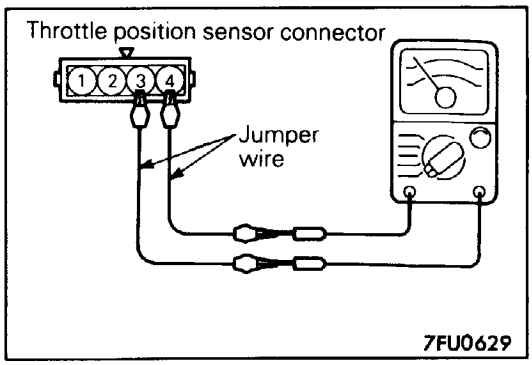
NOTE
In the case of hunting of the idling engine after adjusting the basic idle speed, remove the battery ⊖ cable from the battery terminal for more than 10 seconds, and then idle the engine again.



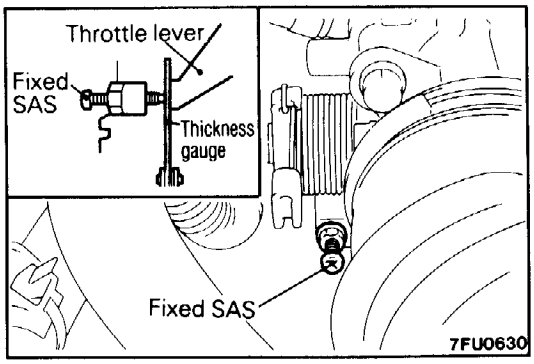


IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT <Except for Vehicles with TCL> E13HAKB

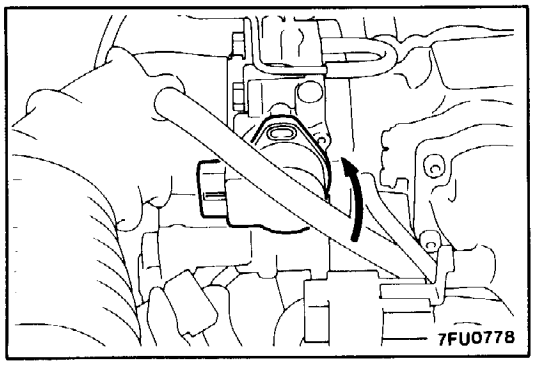
(1) Disconnect the connector of the throttle-position sensor.



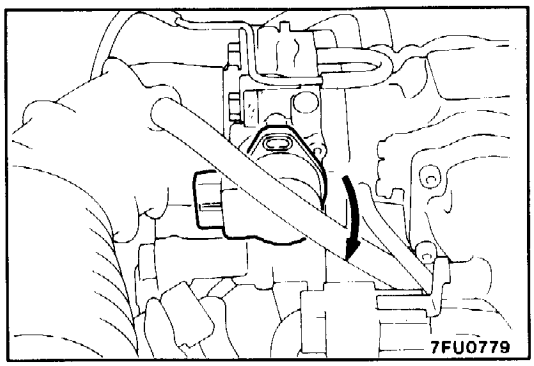
(2) Connect an ohmmeter between terminal ③ (Idle position switch) and ④ (sensor earth) by using jumper wires.



(3) Insert a feeler gauge with a thickness of 0.65 mm (0.0256 in.) between the fixed SAS and the throttle lever.



(4) Loosen the throttle-position sensor installation bolt; then turn fully counterclockwise
(5) In this condition, check for continuity between terminals ③ and ④.

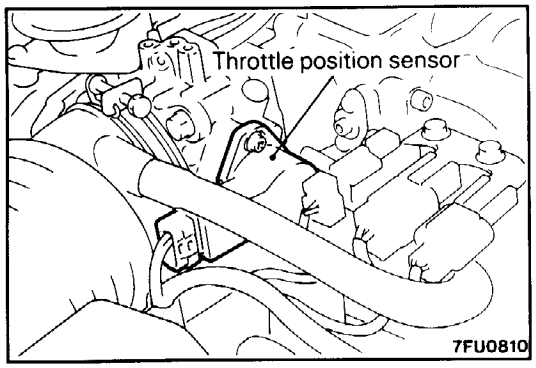


(6) Slowly turn the throttle-position sensor in the clockwise direction until the point at which the continuity between terminals ③ and ④ changes to non-continuity is found. Tighten the throttle-position sensor installation bolt at that position.
(7) Connect the connector of the throttle-position sensor.

(8) Connect the multi-use tester (MUT) to the diagnosis connector.
(9) Turn the ignition switch ON (but do not start the engine).
(10) Using the multi-use tester, select item No. 14 and read the throttle position sensor output voltage.

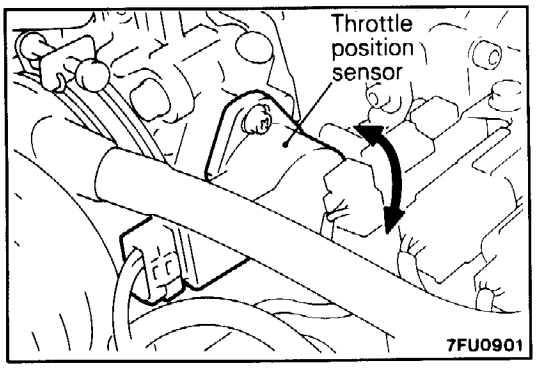
Standard value: 400–1000 mV

(11) If there is a deviation from the standard value, check the throttle-position sensor and the related harness.
(12) Remove the feeler gauge.
(13) Switch OFF the ignition switch.

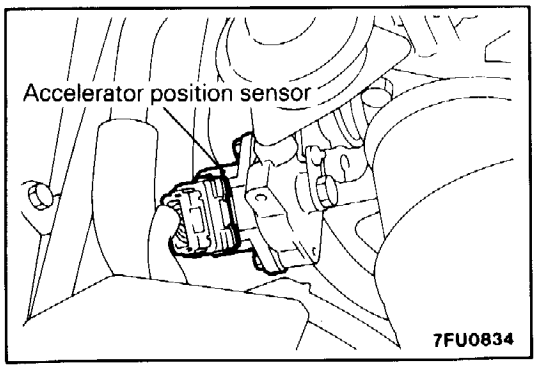


THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles with TCL> E13HALA

(1) Connect the multi-use tester (MUT) to the diagnosis connector.
(2) Turn the ignition switch ON (but do not start the engine).
(3) Using the multi-use tester, select item No. 14 and read the throttle position sensor output voltage.
Standard value: 580–690 mV

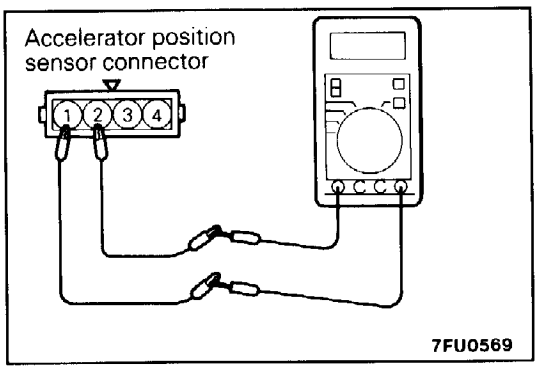


(4) If there is any deviation from the standard value, first remove the throttle body, then loosen the throttle position sensor mounting bolt and turn the throttle position sensor to adjust it. After adjusting, tighten the bolts firmly.
NOTE
Output voltage rises when the throttle position sensor is turned clockwise.
(5) Turn the ignition switch to OFF.
(6) In the case that self diagnosis malfunction codes are output when adjusting the throttle position sensor, use the multi-use tester to erase the self diagnosis codes (thereby erasing the memory for the malfunction codes due to adjustment of the throttle position sensor).

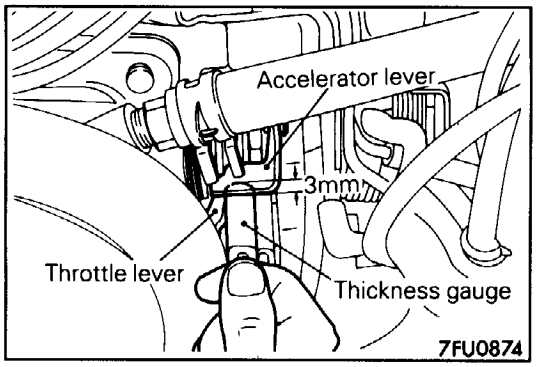


IDLE POSITION SWITCH AND ACCELERATOR POSITION SENSOR (APS) ADJUSTMENT <VEHICLES WITH TCL> E13HAKC

(1) Disconnect the accelerator position sensor connector.

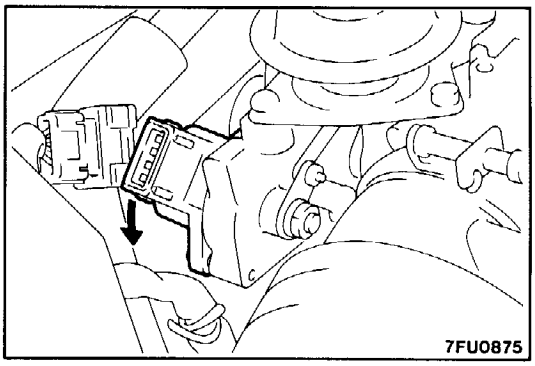


(2) Use jumper wire between terminal ② (idle position switch) on the accelerator position sensor and terminal ① (sensor earth) to connect a resistance tester.

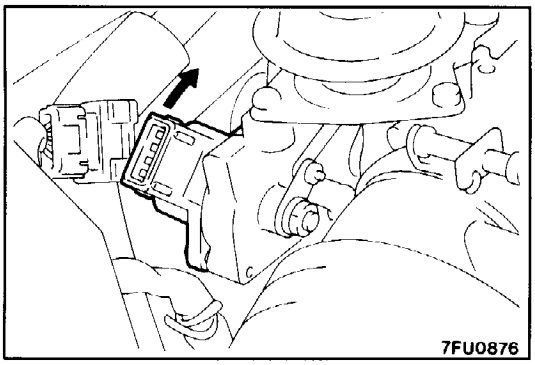


(3) Insert a 0.5 mm (0.02 in.) thickness gauge for about 3 mm (0.12 in.) between the accelerator lever and the throttle lever.

NOTE
If the thickness gauge is inserted deeper than 3 mm (0.12 in.), the accelerator lever opening degree will be made larger than the set opening.



(4) Loosen the accelerator position sensor mounting bolt and turn the accelerator position sensor anticlockwise as far as it will go.
(5) At this time, make sure that there is continuity between the terminals ① and ②.

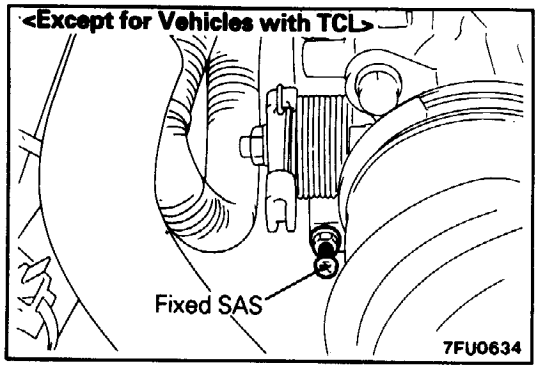


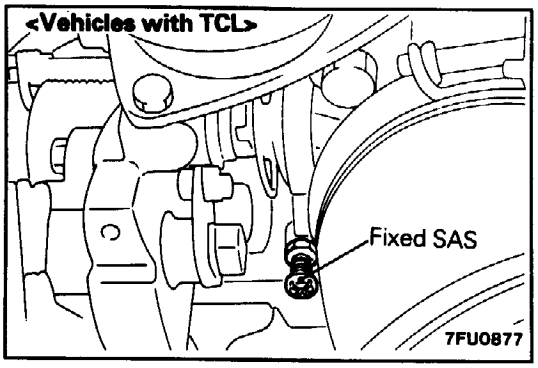
(6) Slowly turn the accelerator position sensor clockwise to find the point where there is no continuity between the terminals ① and ②. Firmly tighten the accelerator position sensor mounting bolt at this point.
(7) Connect the accelerator position sensor connector.

(8) Connect the multi-use tester (MUT) to the diagnosis connector.
(9) Turn the ignition switch ON. (Do not start the engine.)
(10) After selecting "TRACTION CONTROL" with the multi-use tester, select item No. 11 and read the accelerator position sensor output voltage.

Standard value: 400–1000 mV

(11) If the voltage is out of specification, check the accelerator position sensor and associated harnesses.
(12) Remove the thickness gauge.
(13) Turn the ignition switch OFF.





FIXED SAS ADJUSTMENT E13HAMA

NOTE
1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment for any reason is disturbed, readjust as follows.

(1) Loosen the tension of the accelerator cable sufficiently.
(2) Back out the fixed SAS lock nut.
(3) Turn the fixed SAS anticlockwise until it is sufficiently backed out, and securely close the throttle valve fully.

(4) Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.
From that point, tighten the fixed SAS 1-1/4 turn.
(5) While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
(6) Adjust the tension of the accelerator cable.
(7) Adjust the basic idling speed (speed adjusting screw).
(8) Adjust the idle position switch and throttle position sensor. (Refer to P. 13-43.)
(9) Adjust the throttle position sensor, idle position switch and accelerator position sensor. <Vehicles with TCL> (Refer to page 13-45.)

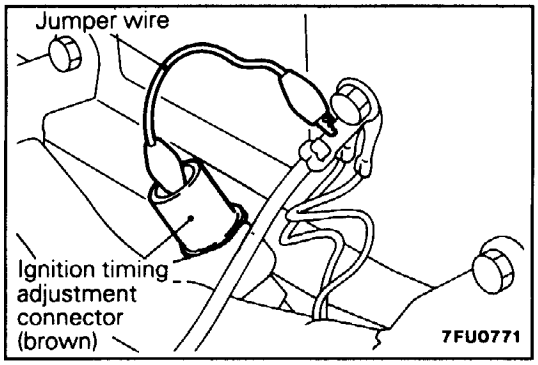
BASIC IDLE SPEED ADJUSTMENT E13HANB

NOTE
1. The standard idling speed has been adjusted, by the speed-adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
2. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle-speed control servo, the compression pressure, etc. are all normal.

(1) The vehicle should be prepared as follows before the inspection and adjustment.
- Engine coolant temperature: 80–95°C (176–205°F)
- Lamps, electric cooling fan and accessories: OFF
- Transmission: neutral
- Steering wheel: neutral position

(2) Connect the multi-use tester (MUT) to the diagnosis connector.

NOTE
The diagnosis control terminal is earthed when connecting the multi-use tester.

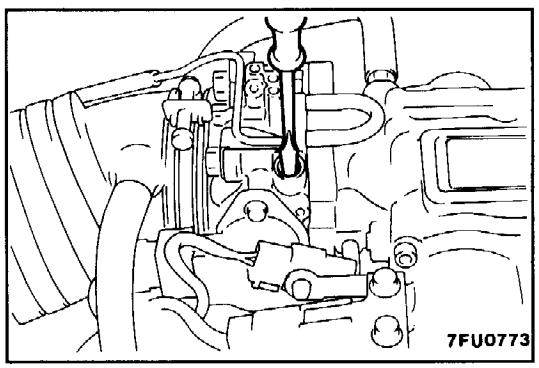


(3) Remove the waterproof female connector from the ignition timing adjusting connector.
(4) Use a jumper wire to earth the terminal for adjustment of ignition timing.

(5) Start the engine and run at idle.
(6) Using the multi-use tester, select item No. 38 and read the idle speed.

Standard value: 700±50 r/min

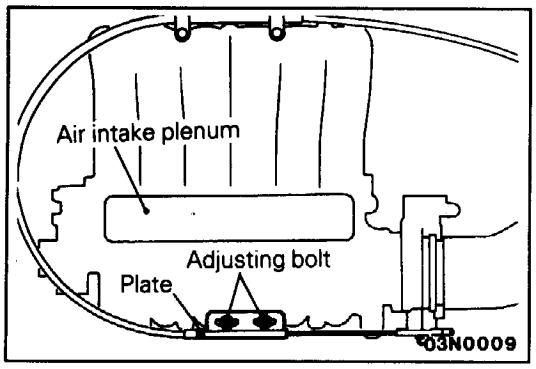
NOTE
1. The engine speed may be 20 to 100 r/min. lower than indicated above for a new vehicle (driven approximately 500 km (300 miles) or less), but no adjustment is necessary.
2. If the engine stalls or the rpm is low even though the vehicle has been driven approximately 500 km (300 miles) or more, it is probable that deposits are adhered to the throttle valve, so clean it.
(Refer to P. 13-43.)

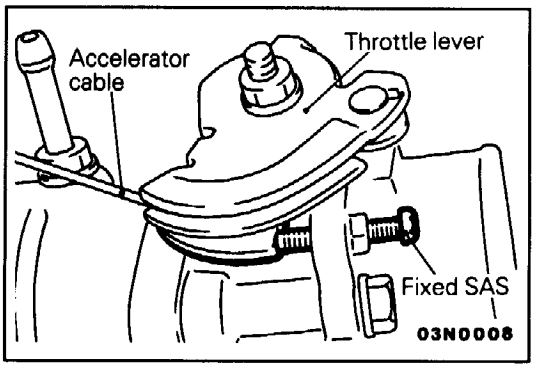


(7) If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

NOTE
If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS. If there are no indications that it has been moved, it is possible that there is leakage as a result of deterioration of the fast idle air valve (FIAV), and, if so, the throttle body should be replaced.

(8) Switch OFF the ignition switch.
(9) Disconnect the jumper wire from the terminal for adjustment of ignition timing, and return the connector to its original condition.
(10) Start the engine again and let it run at idle speed for about ten minutes; check to be sure that the idling condition is normal.



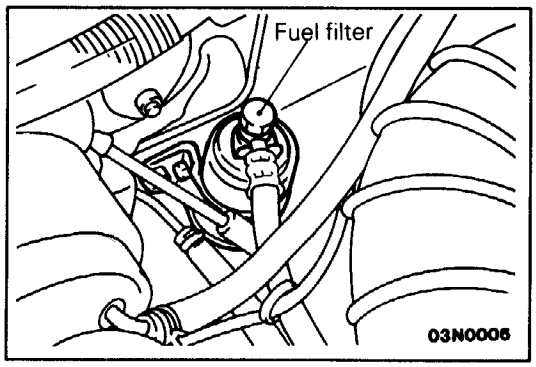


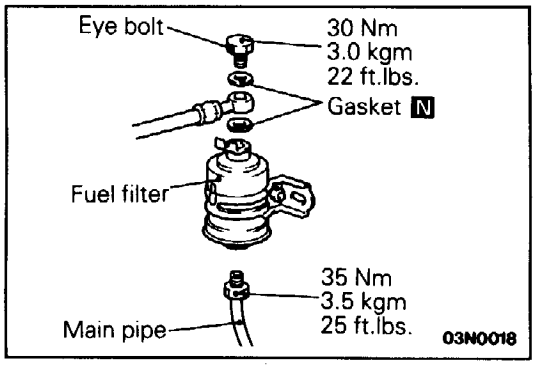
ACCELERATOR CABLE INSPECTION AND ADJUSTMENT E13FCAYa

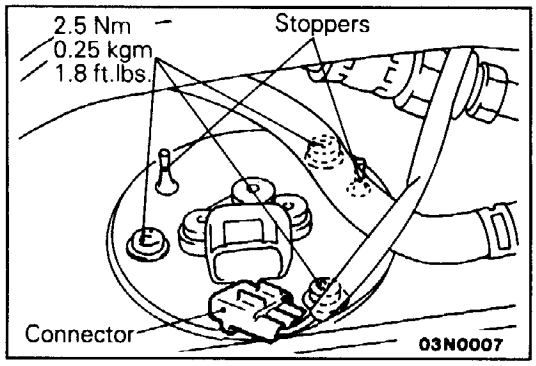
<VEHICLES WITHOUT AUTO-CRUISE CONTROL>

(1) Turn the air conditioner and light switches to OFF so that there is no electrical load when checking.
(2) Check that the throttle lever is touching the fixed SAS (stopper).
(3) Make sure that there are no sharp bends in the accelerator cable wiring.
(4) Check the amount of play in the inner cable.
(5) If there is a large amount of play in the inner cable, or if there is no play at all, adjust by the following measures.
  ① Loosen the adjusting bolt.
  ② Move the plate so the inner cable play is brought to the standard value, and then tighten the adjusting bolt.

Standard value: 1–2 mm (0.04–0.08 in.) <M/T>
3–5 mm (0.12–0.20 in.) <A/T>







FUEL FILTER REPLACEMENT E13FZAK

(1) Release the residual pressure inside the fuel line.
(2) Remove the air intake hose.
(3) Hold the fuel filter with a spanner, and remove the high pressure fuel hose and the eye bolt.

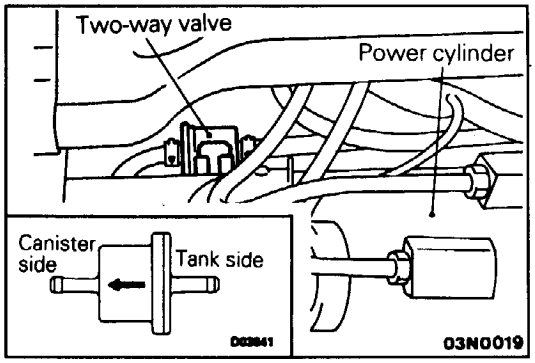
Caution
The fuel pipe line has some residual pressure, so cover it with a rag, etc.

(4) Hold the fuel pump with a spanner, and loosen the flare nut to release the connection with the fuel main pipe.
(5) Remove the fuel filter.
(6) When installing the fuel filter, use a new gasket, and tighten the high pressure fuel hose and fuel main pipe flare nuts at the specified torque.
(7) After installation, check that there are no fuel leakages.
   ① Apply the battery voltage to the fuel pump drive terminal and operate the fuel pump. (Refer to P.13-51.)
   ② Check for fuel leakages when the fuel is under pressure.

FUEL GAUGE UNIT REPLACEMENT E13FDAB

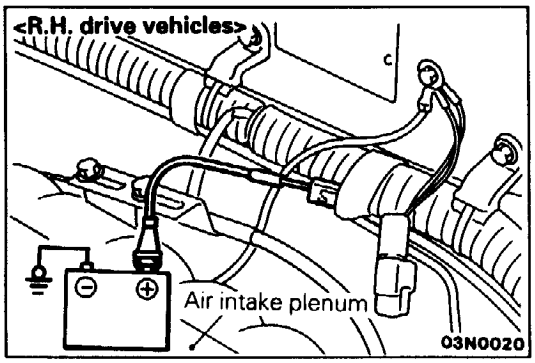
(1) For vehicles with 4WS, remove the rear wheel steering power cylinder attachment bolt, and lower the cylinder.
(2) Remove the connector from the fuel gauge unit, and remove the unit.
(3) Align the packing stoppers (2 places) with the holes in the fuel gauge unit.
(4) When installing the fuel gauge unit, tilt the end of the float to the left before placing it inside the fuel tank.

NOTE
There is a reservoir cup inside the fuel tank, so if the fuel gauge unit is tilted to the right when placed in, the fuel gauge unit will hit the reservoir cap.



TWO-WAY VALVE REPLACEMENT E13FFAB

(1) For vehicles with 4WS, remove the rear wheel steering power cylinder attachment bolt, and lower the cylinder.
(2) Remove the two-way valve.
(3) Install so that the installation direction of the two-way valve is correct.

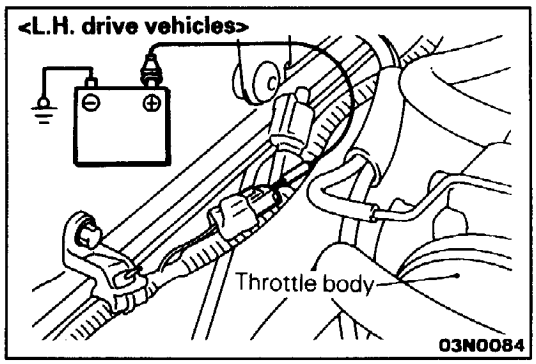


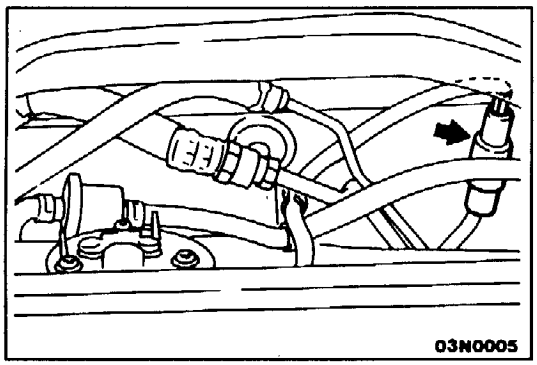
FUEL PUMP OPERATION CHECK E13FGCD

(1) Check the operation of the fuel pump by using the multi-use tester to force-drive the fuel pump.
(2) If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
    ① Turn the ignition switch to OFF.
    ② When the fuel pump drive connector (black) is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

    NOTE
    As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel tank cap and check from the tank inlet.

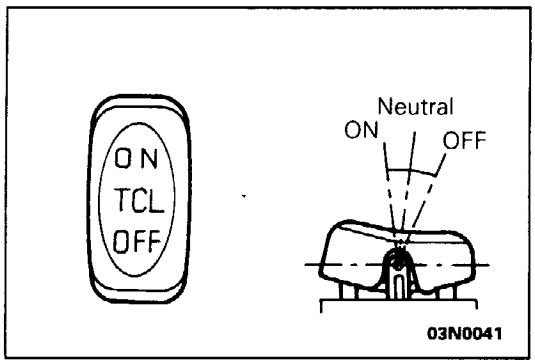
    ③ Check the fuel pressure by pinching the fuel hose with the fingertips.





FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE) E13HABF

When removing the fuel pipe, hose, etc., since fuel pressure in the fuel pipe line is high, do the following operation so as to release fuel pressure in the line and prevent fuel from running out.
(1) Lift up the vehicle and remove the fuel pump connector mounted on the rear of the fuel tank.
(2) After starting the engine and then letting it stop naturally, turn the ignition switch OFF.
(3) Connect the fuel pump connector.



INSPECTING OPERATION OF THE TCL (TRACTION CONTROL) SYSTEM E13HCAAa

INSPECTING THE ILLUMINATION OF THE TCL SWITCH

When the headlamp is illuminated (tail lamp relay is operating), check if the TCL switch indicator is illuminated.

INSPECTION OF THE TCL INDICATOR LAMPS

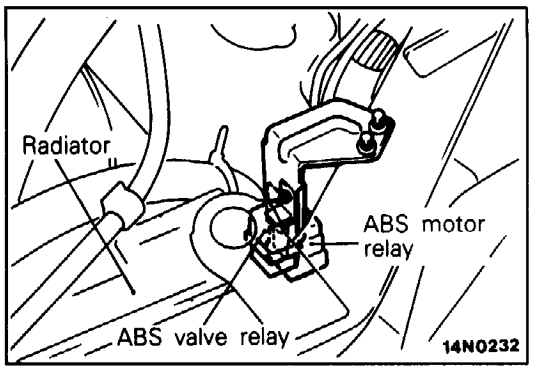
1. Check if each indicator lamp is illuminated when the TCL switch is pressed.

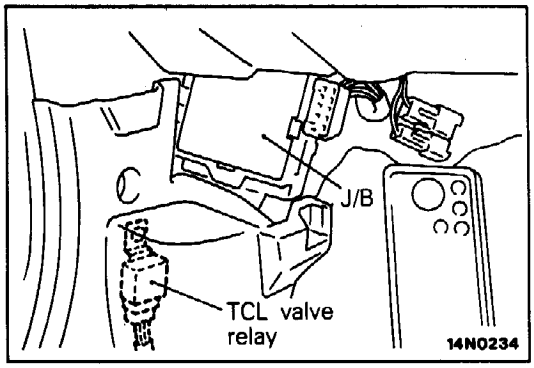
TCL switch mode	Inspection conditions	Indicator lamp		
		TCL OFF	TCL	TRACE OFF
Switch does not operate.	Turn the ignition key to the ON position.	○	○	○
	Start the engine.	×	×	×
TRACE OFF mode (press once to OFF)	Engine is idling	–	–	○
TCL OFF mode (press once more to OFF)		○	–	–
TCL ON mode	When the engine is idling, turn the steering wheel at least one and a half revolutions.	No illumination	–	–
	Drive the vehicle at 30 km/h (19 mph) for 2 minutes or more.	No illumination	–	–
	With the engine idling, shift the transmission gear to the reverse range and hold 3 seconds or more [M/T].	No illumination	–	–
	Shift the transmission gear to the 1st range and drive the vehicle at over 40 km/h (25 mph) 'for 1 minute or more [M/T].	No illumination	–	–

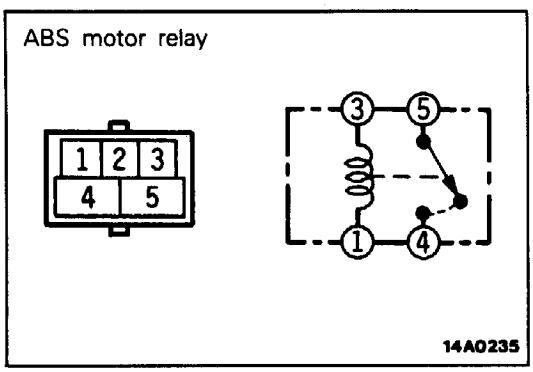
NOTE
○: illuminated, ×: extinguished, –: not relevant

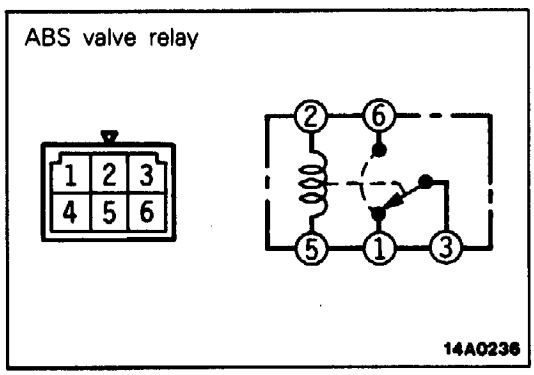
Caution
If a different result is obtained when checking, refer to the "Troubleshooting" section for remedy.

2. When the headlamp is illuminated (tail lamp relay is operating), check if each indicator lamp is dimmed.









INSPECTING THE MOTOR RELAY AND VALVE RELAY

E35FPAP

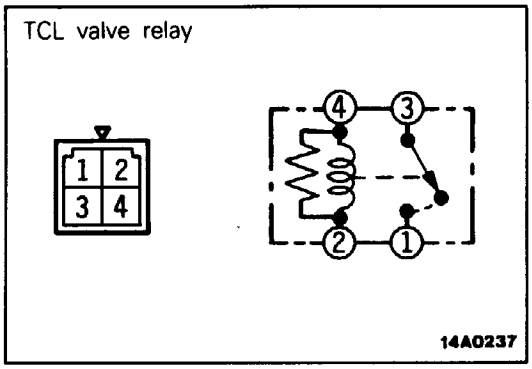
Check for continuity between the terminals of the relay with and without power as shown in the chart overleaf.

ABS motor relay <when energizing coil is at normal temperature (20° ± 15°C [68° ± 27°F])>

When there is no current	Between terminals ③ and ①	74 ± 25Ω
	Between terminals ④ and ⑤	No continuity (∞ Ω)
When there is current between terminals ③ and ①	Between terminals ④ and ⑤	Continuity (approx. 0Ω)

ABS valve relay <when energizing coil is at normal temperature (20° ± 15°C [68° ± 27°F])>

When there is no current	Between terminals ② and ⑤	80 ± 25Ω
	Between terminals ① and ③	Continuity (approx. 0Ω)
	Between terminals ③ and ⑥	No continuity (∞ Ω)
When there is current between terminals ② and ⑤	Between terminals ① and ③	No continuity (∞ Ω)
	Between terminals ③ and ⑥	Continuity (approx. 0Ω)



TCL valve relay <when energizing coil is at normal temperature (20°±5°C [68°±9°F])>

When there is no current	Between terminals ④ and ②	$100^{+25}_{-14}\ \Omega$
	Between terminals ③ and ①	No continuity (∞ Ω)
When there is current between terminals ④ and ②	Between terminals ③ and ①	Continuity (approx. 0Ω)

INSPECTING THE TCL HYDRAULIC SYSTEM

INSPECTION USING THE BRAKING FORCE TESTER

NOTE
1. The roller of the braking force tester and the tyre should be dry during testing.
2. The parking brake should be applied to lock the rear wheels.

1. Place the front wheel of the vehicle on the rollers of the braking force tester.
2. Turn the ignition key to the OFF position and set the multi-use tester <Up to 1993 models> or MUT-II <All models> as shown in the diagram.

   Caution
   Connection and disconnection of the multi-use tester or MUT-II should always be made with the ignition switch in the OFF position.

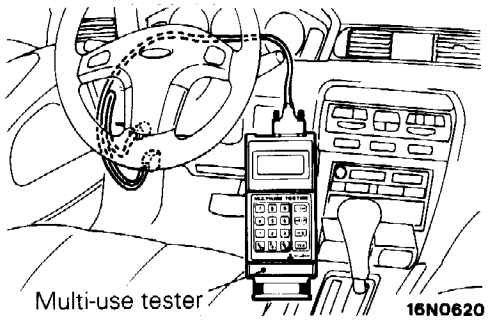
3. After checking that the selector lever is in neutral, start the engine.

   Caution
   At this time, check that the TCL-related indicator lamps momentarily illuminate before switching off.
   If they do not switch off, refer to the "Troubleshooting" section (P.13-18-1).

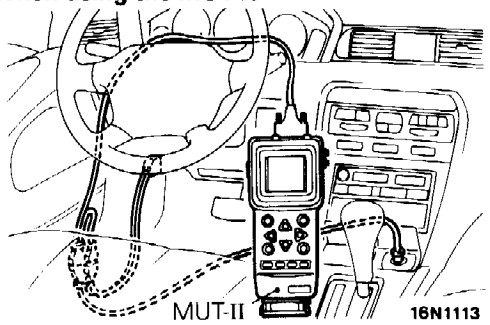
4. Operate the rollers of the braking force tester and keep the steering wheel straight.
5. When the brake pedal is released, perform an actuator test with the multi-use tester or MUT-II (Item Nos. 01, 02) and take a reading of the change in braking force.
   For diagnosis and remedy, refer to the following "diagnosis table".

   NOTE
   1. When the multi-use tester or MUT-II is operated and the TCL system is selected, the TCL system will switch to multi-use tester or MUT-II mode and the TCL indicator lamp will illuminate.
   2. When the TCL has been interrupted by the fail-safe function, the multi-use tester or MUT-II actuator testing cannot be used.

When using the multi-use tester



When using the MUT-II

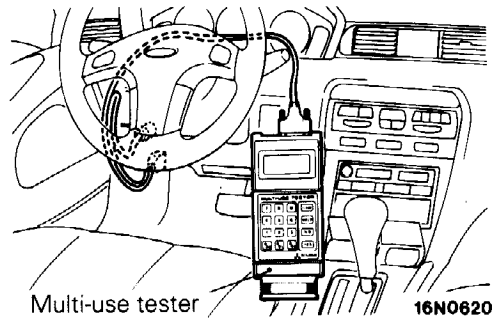


Diagnosis Table

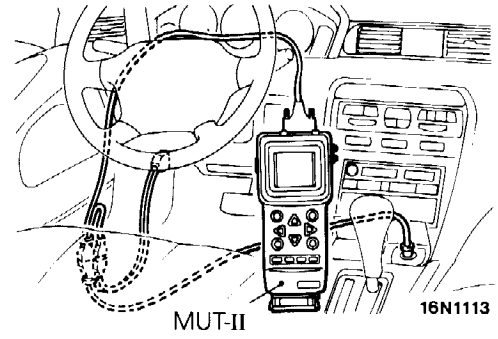
<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Operation</th><th colspan="2">Diagnosis (braking force tester reading)</th><th rowspan="2">Cause</th><th rowspan="2">Remedy</th></tr>
<tr><th>Normal</th><th>Problem</th></tr>
<tr><td rowspan="2">01</td><td rowspan="3">Operate the multi-use tester or MUT-II to force-drive the actuator, and check the change in braking force.</td><td rowspan="3">When the actuator is force-driven by the multi-use tester or MUT-II the brake force will change in the following way.
N (kg, lbs.)
Approx. 200 (20, 44)
Step 1
700–900 (70–90, 154–198)
Step 2 (After approw. 3 seconds)
350–650 (35–65, 77–143)
Step 3 (After approx. 3 seconds)
Approx. 200 (20, 44)</td><td rowspan="2">Braking force at step 1 is very slight or hardly increases at all.</td><td>Hydraulic unit brake pipes are incorrectly connected.</td><td>Connect correctly.</td></tr>
<tr><td>Hydraulic unit is faulty.</td><td>Replace the hydraulic unit.</td></tr>
<tr><td>02</td><td>Braking force increases at step 1, but the decrease in braking force at step 2 is very slight or almost non-existent.</td><td>Hydraulic unit is faulty.</td><td>Replace the hydraulic unit.</td></tr>
</table>

NOTE
1. For drive conditions, the wheel speed of both front wheels should be 0 km/h (0 mph), and the maximum wheel speed of the wheel to be tested for braking force should be less than 10 km/h (6 mph).
2. The above reasons for problems are given on the assumption that all brake components other than the hydraulic unit are functioning normally.

When using the multi-use tester



When using the MUT-II



SIMPLE INSPECTION

1. Jack up the front wheels, and support on axle stands.
2. After checking that the selector level is neutral, feel the drag force (drag torque) for each wheel brake.
3. Turn the ignition key to the ACC position and set the multi-use tester or MUT-II as shown in the diagram.

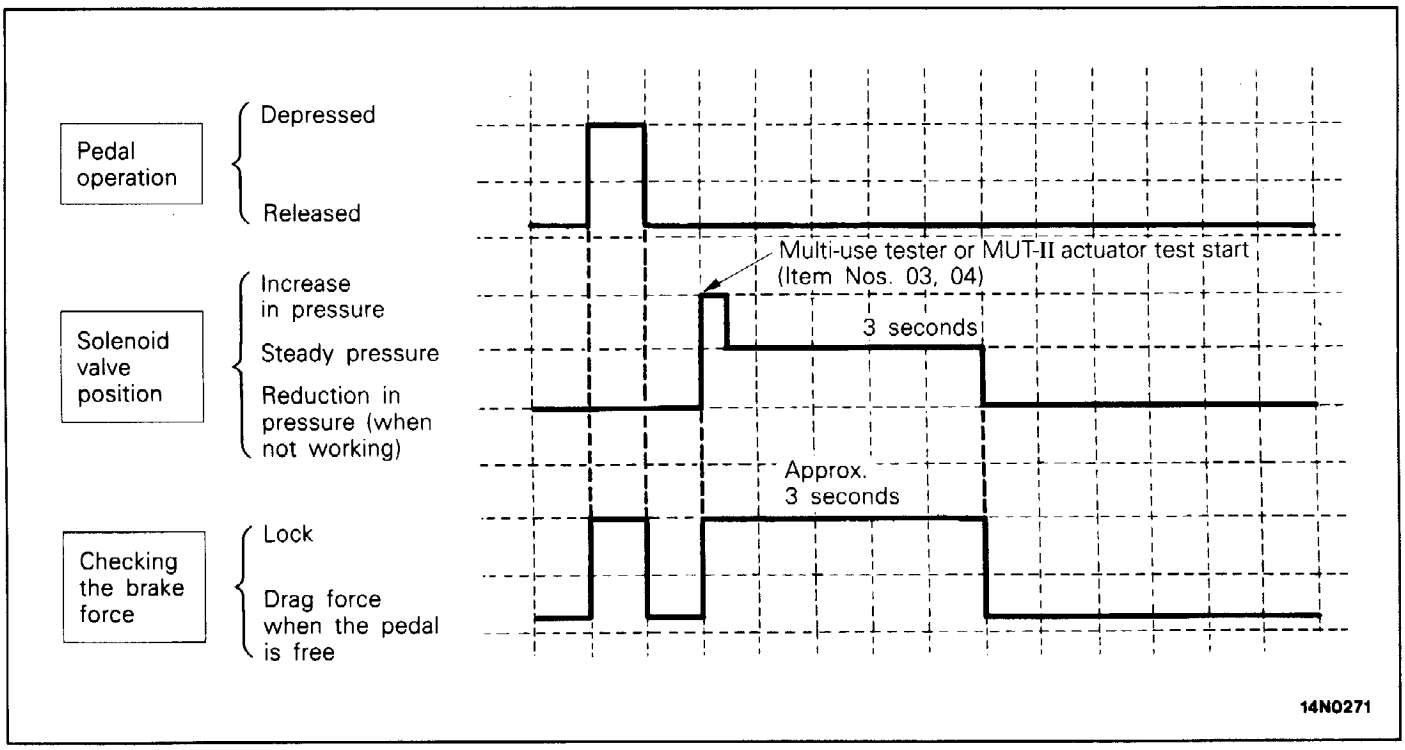
   Caution
   Connection and disconnection of the multi-use tester or MUT-II should always be made with the ignition switch in the OFF position.

4. Start the engine.

   Caution
   At this time, check that the TCL-related indicator lamps momentarily illuminate before switching off. If they do not switch off, refer to the "Troubleshooting" section (P.13-18-1).

5. Check that the wheels lock when the brake pedal is depressed, and that they become free when the pedal is released.
6. When the brake pedal is released, operate the multi-use tester or MUT-II to force-drive the actuator.
7. Rotate the wheel manually and check the change in braking force.
   The result should be as shown in the following diagram.

   NOTE
   1. When the multi-use tester or MUT-II is operated and the TCL system is selected, the TCL system will switch to multi-use tester or MUT-II mode and the TCL OFF indicator lamp will illuminate.
   2. When the TCL-ECU function has been interrupted by the fail-safe function, the multi-use tester or MUT-II actuator testing cannot be performed.



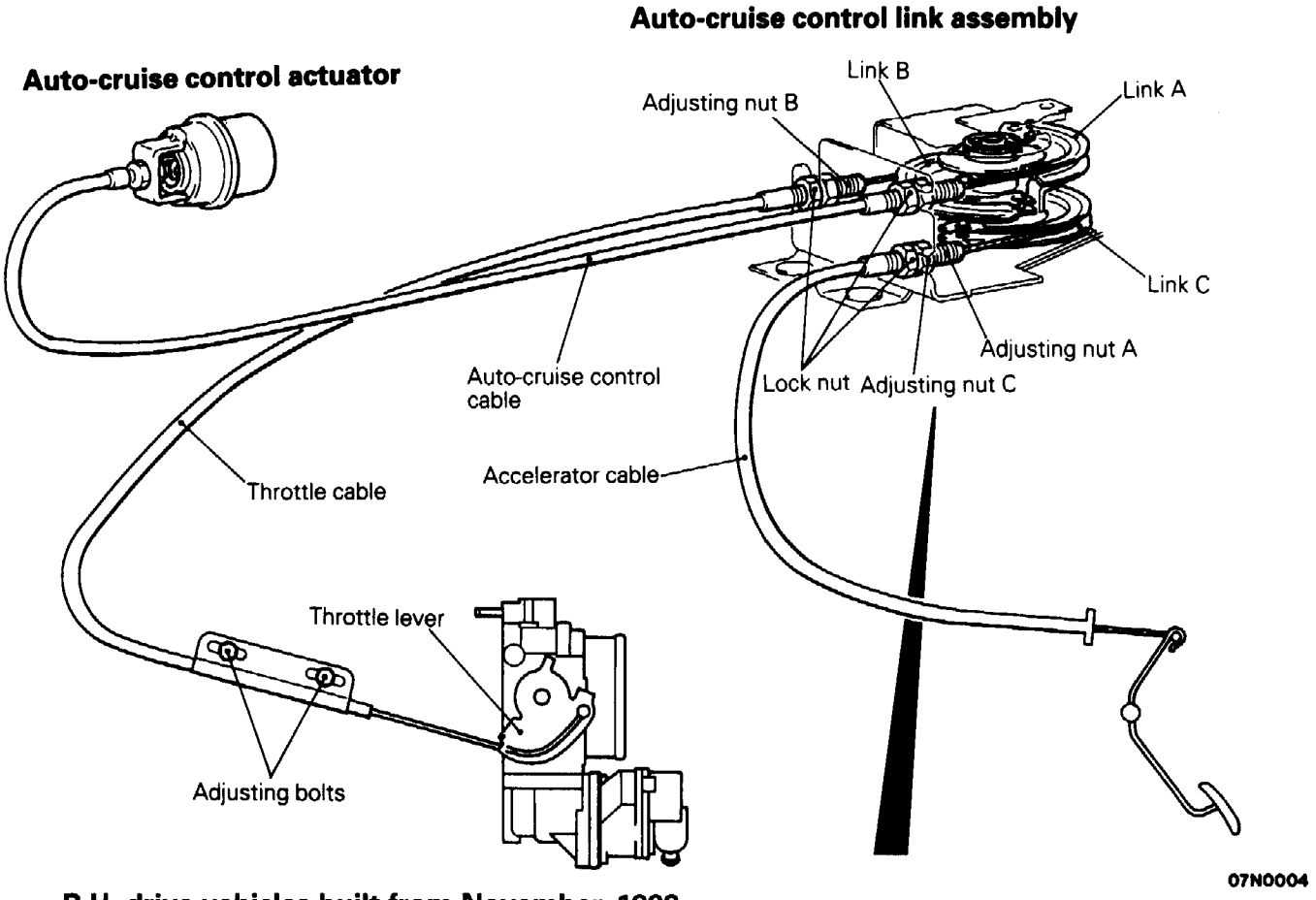
8. If a different result is obtained when checking, correct it by following the procedure in the "diagnosis table".

Diagnosis Table

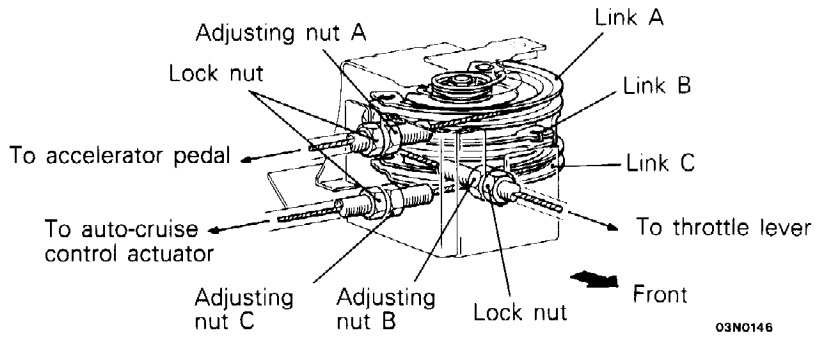
No.	Operation	Diagnosis (braking force tester reading)		Cause	Remedy
		Normal	Problem		
03	1. Rotate the wheel when the brake pedal is released. 2. Choose the wheel to be checked with the multi-use tester or MUT-II, and force-drive the actuator. 3. Rotate the selected wheel manually to check the change in braking force.	After continuous locking for a 3 second period, the braking force will decrease.	The wheel will not lock.	Hydraulic unit brake pipes are incorrectly connected.	Connect correctly.
04				Hydraulic unit is faulty.	Replace the hydraulic unit.

AUTO-CRUISE CONTROL CABLES INSPECTION AND ADJUSTMENT

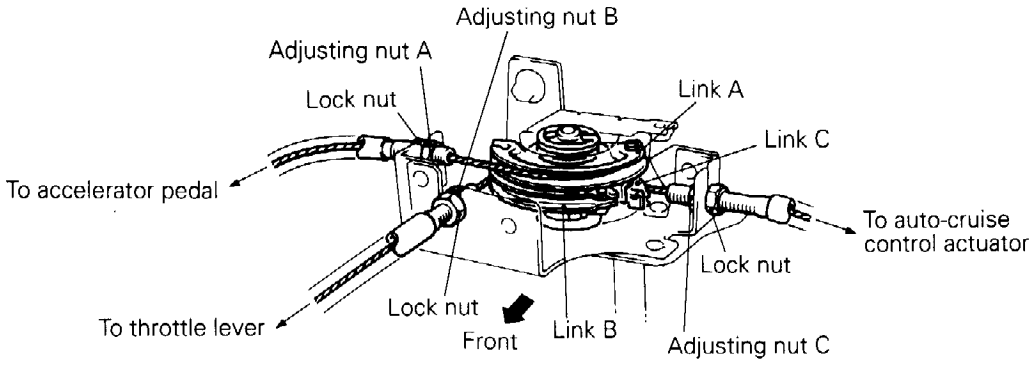
E13FYAI

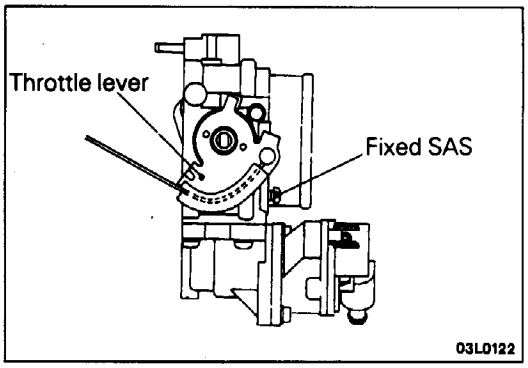


<R.H. drive vehicles built from November, 1992>



<L.H. drive vehicles built from May, 1994>



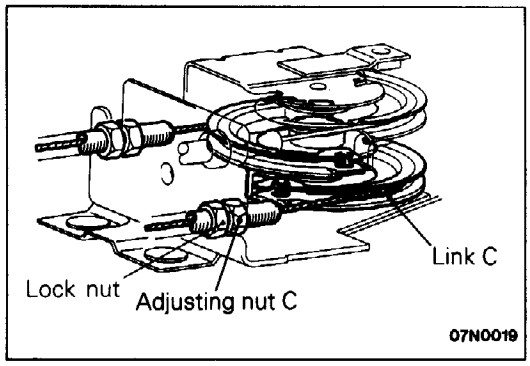


(1) Turn air conditioner and lamps OFF. Inspect and adjust at no load.
(2) Check if the end of the fixed SAS is touching the throttle lever stopper.

(3) Confirm there are no sharp bends in cables.
(4) Depress the accelerator pedal and check if the throttle lever moves smoothly from fully closed to fully open.
(5) Check inner cables for correct slack.
(6) If there is too much slack or no slack, adjust play by the following procedures.

<L.H. drive vehicles built up to April, 1994, R.H. drive vehicles built up to October, 1992>

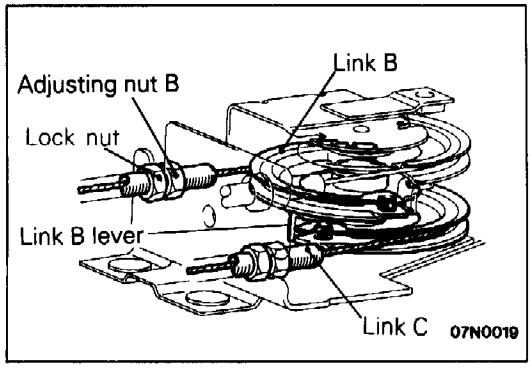
① Remove the actuator's cover.
② Loosen the adjusting nuts and lock nuts of the throttle lever and intermediate links A, B and C, so that the intermediate links A, B and C and the throttle lever can mover freely.



③ Rotate the intermediate link C in the direction shown in the diagram, and while keeping it touching the stopper, tighten the adjusting nut C in the direction to lessen the inner cable play of the accelerator cable. Then unscrew the adjusting nut C the specified number of turns just before the intermediate link C begins to move.

Amount to unscrew the adjusting nut C:
<M/T> Approx. half a turn [inner cable paly 0–1 mm (0–0.04 in.)]
<A/T> Approx. 2 turns [inner cable paly 2–3 mm (0.08–0.12 in.)]

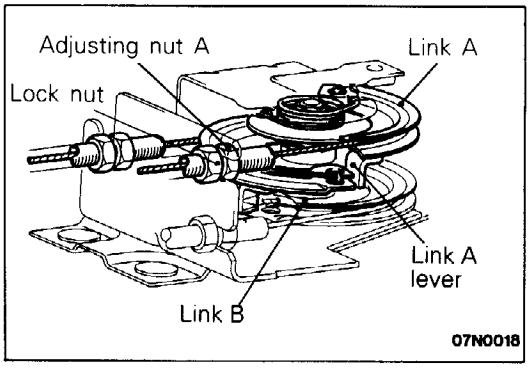
④ Fix the accelerator cable with the lock nut.



⑤ Tighten the adjusting nut B in the direction to lessen the inner cable paly of the throttle cable. At the position where the intermediate link B lever touches the intermediate link C, unscrew the adjusting nut B the specified number of turns.

Amount to unscrew the adjusting nut B:
Approx. 1 turn [inner cable play 1–2 mm (0.04–0.08 in.)]

⑥ Fix the throttle cable with the lock nut.
⑦ Tighten the air intake plenum adjusting bolt.



⑧ Tighten the adjusting nut A in the direction to lessen the inner cable play of the cruise control cable. At the position where the intermediate link A lever touches the intermediate link B, unscrew the adjusting nut A the specified number of turns.

Amount to unscrew the adjusting nut A:
Approx. 1 turn [inner cable play 1–2 mm (0.04–0.08 in.)]

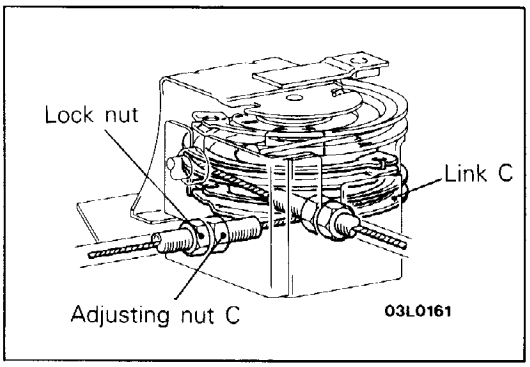
⑨ Fix the auto-cruise cable with the lock nut.

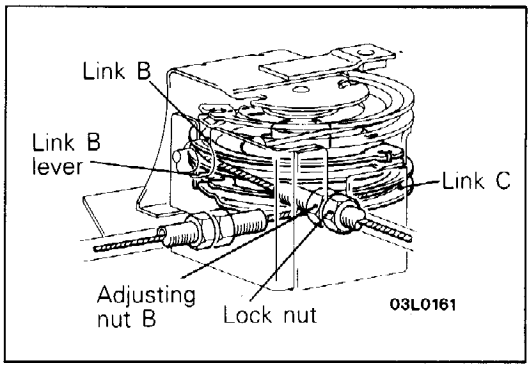
<R.H. drive vehicles built from November, 1992>

① Remove the actuator's cover.
② Loosen the adjusting nuts and lock nuts of the throttle lever and intermediate links A, B and C, so that the intermediate links A, B and C and the throttle lever can mover freely.
③ Rotate the intermediate link C in the direction shown in the diagram, and while keeping it touching the stopper, tighten the adjusting nut C in the direction to lessen the inner cable play of the accelerator cable. Then unscrew the adjusting nut C the specified number of turns just before the intermediate link C begins to move.

Amount to unscrew the adjusting nut C:
<M/T> Approx. half a turn [inner cable paly 0–1 mm (0–0.04 in.)]
<A/T> Approx. 2 turns [inner cable paly 2–3 mm (0.08–0.12 in.)]

④ Fix the accelerator cable with the lock nut.

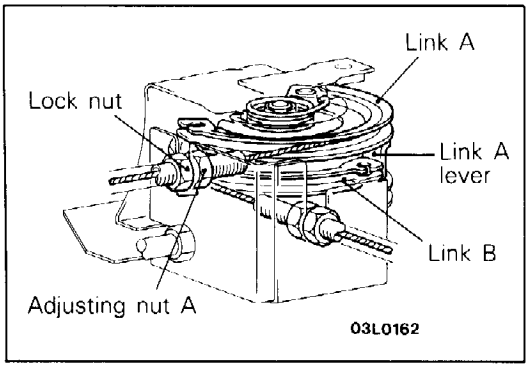




⑤ Tighten the adjusting nut B in the direction to lessen the inner cable paly of the throttle cable. At the position where the intermediate link B lever touches the intermediate link C, unscrew the adjusting nut B the specified number of turns.

Amount to unscrew the adjusting nut B:
Approx. 1 turn [inner cable play 1–2 mm (0.04–0.08 in.)]

⑥ Fix the throttle cable with the lock nut.
⑦ Tighten the air intake plenum adjusting bolt.

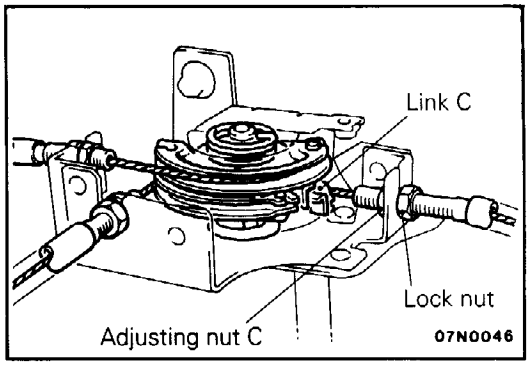


⑧ Tighten the adjusting nut A in the direction to lessen the inner cable play of the cruise control cable. At the position where the intermediate link A lever touches the intermediate link B, unscrew the adjusting nut A the specified number of turns.

Amount to unscrew the adjusting nut A:
Approx. 1 turn [inner cable play 1–2 mm (0.04–0.08 in.)]

⑨ Fix the auto-cruise cable with the lock nut.

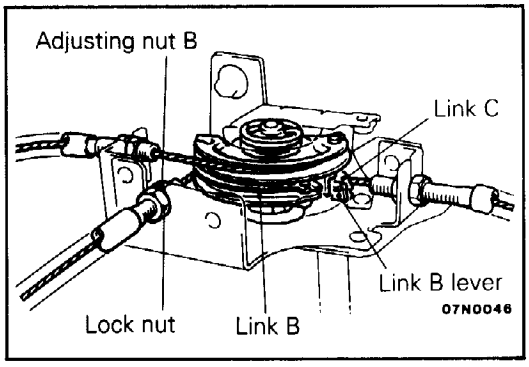
<L.H. drive vehicles built from May, 1994>



① Remove the actuator's cover.
② Loosen the adjusting nuts and lock nuts of the throttle lever and intermediate links A, B and C, so that the intermediate links A, B and C and the throttle lever can mover freely.
③ Rotate the intermediate link C in the direction shown in the diagram, and while keeping it touching the stopper, tighten the adjusting nut C in the direction to lessen the inner cable play of the accelerator cable. Then unscrew the adjusting nut C the specified number of turns just before the intermediate link C begins to move.

Amount to unscrew the adjusting nut C:
<M/T> Approx. half a turn [inner cable paly 0–1 mm (0–0.04 in.)]
<A/T> Approx. 2 turns [inner cable paly 2–3 mm (0.08–0.12 in.)]

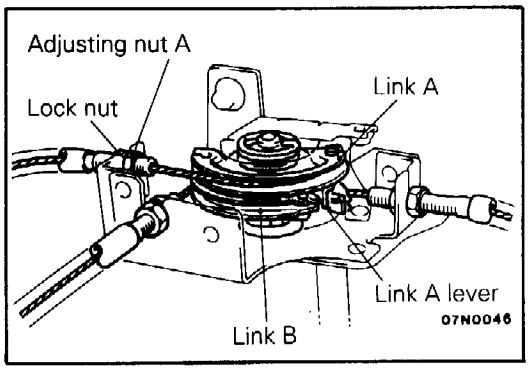
④ Fix the accelerator cable with the lock nut.



⑤ Tighten the adjusting nut B in the direction to lessen the inner cable paly of the throttle cable. At the position where the intermediate link B lever touches the intermediate link C, unscrew the adjusting nut B the specified number of turns.

Amount to unscrew the adjusting nut B:
Approx. 1 turn [inner cable play 1–2 mm (0.04–0.08 in.)]

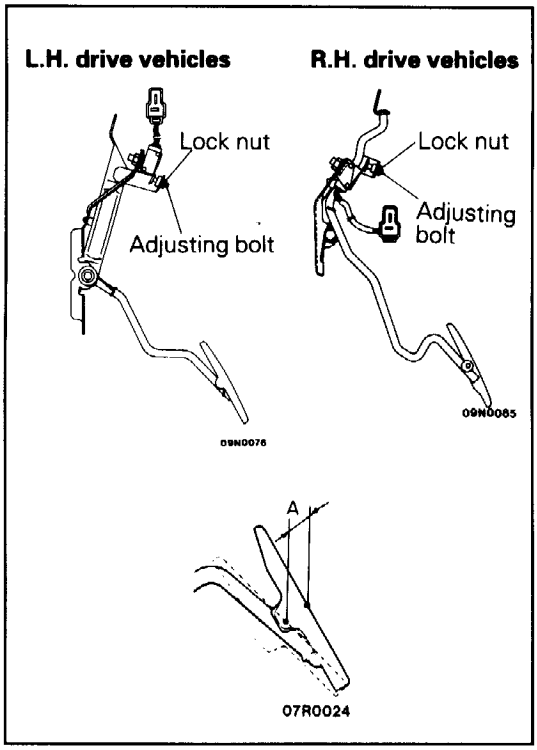
⑥ Fix the throttle cable with the lock nut.
⑦ Tighten the air intake plenum adjusting bolt.



⑧ Tighten the adjusting nut A in the direction to lessen the inner cable play of the cruise control cable. At the position where the intermediate link A lever touches the intermediate link B, unscrew the adjusting nut A the specified number of turns.

Amount to unscrew the adjusting nut A:
Approx. 1 turn [inner cable play 1–2 mm (0.04–0.08 in.)]

⑨ Fix the auto-cruise cable with the lock nut.



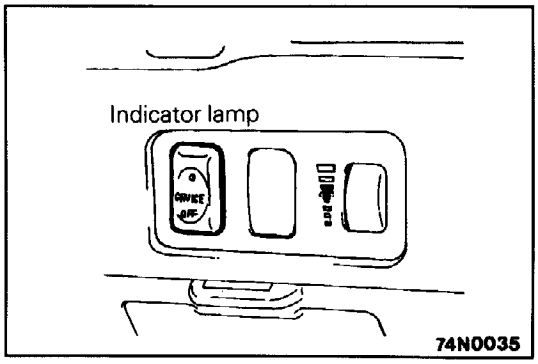
ACCELERATOR PEDAL SWITCH INSPECTION AND ADJUSTMENT

<A/T models built up to October, 1991>

(1) Warm the engine until the engine coolant temperature reaches normal temperature [80–90°C (176–194°F)], and then stop the engine.
(2) Check if there is continuity between the accelerator pedal switch terminals when the accelerator pedal is free.
(3) Check if there is no continuity between the accelerator pedal switch terminals when the accelerator pedal switch is depressed, and the stroke A in the diagram is at the standard value.

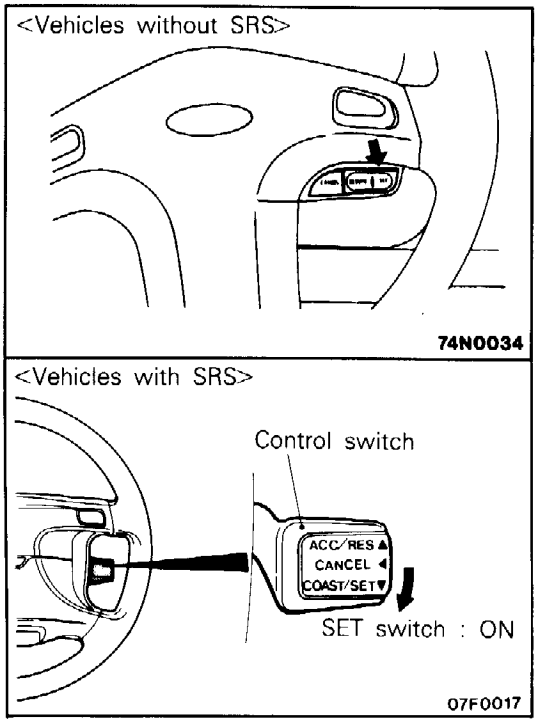
Standard value (A): 2–6 mm (0.08–0.24 in.)

(4) If the stroke departs from the standard value, adjust with the adjusting bolt.



AUTO-CRUISE CONTROL MAIN SWITCH CHECK

(1) Turn the ignition key to ON.
(2) Check to be sure that the indicator lamp within the switch illuminates when the main switch is switched ON.

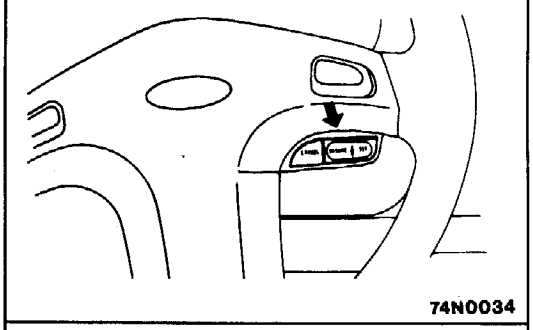


AUTO-CRUISE CONTROL SETTING CHECK

(1) Switch ON the main switch.
(2) Drive at the desired speed within the range of approximately 40–200 km/h (25–125 mph).
(3) Switch ON the SET switch.
(4) Check to be sure that when the switch is released the speed is the desired constant speed.

NOTE
If the vehicles speed decreases to approximately 15 km/h (9 mph) below the set speed because of climbing a hill for example, the automatic speed control will be cancelled.

<Vehicles without SRS>



74N0034

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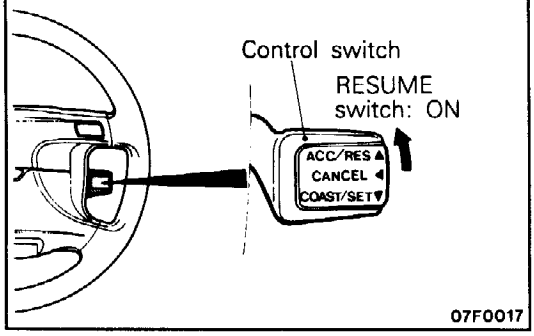
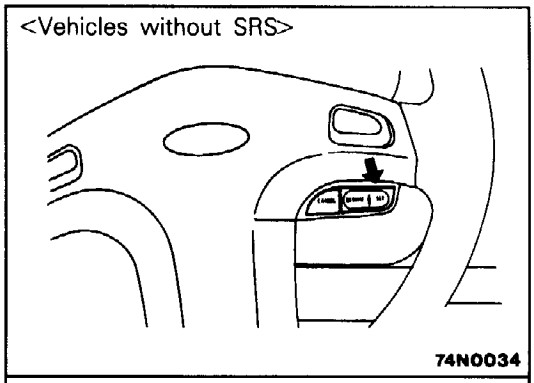


07F0017

SPEED-INCREASE SETTING CHECK

(1) Set to the desired speed.
(2) Switch ON the RESUME switch.
(3) Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.

<Vehicles without SRS>



74N0034

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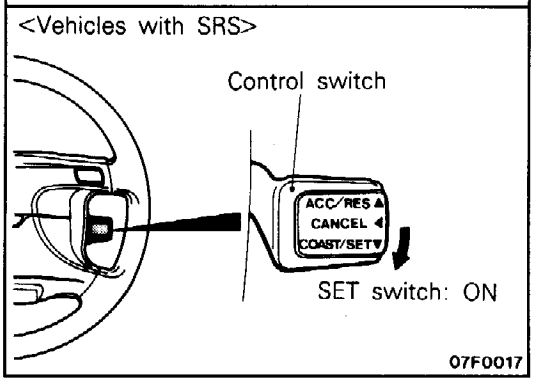


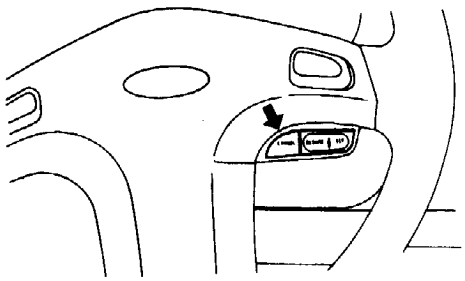
07F0017

SPEED REDUCTION SETTING CHECK

(1) Set to the desired speed.
(2) Switch ON the SET switch.
(3) Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE
When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the automatic speed control will be cancelled.

<Vehicles without SRS>



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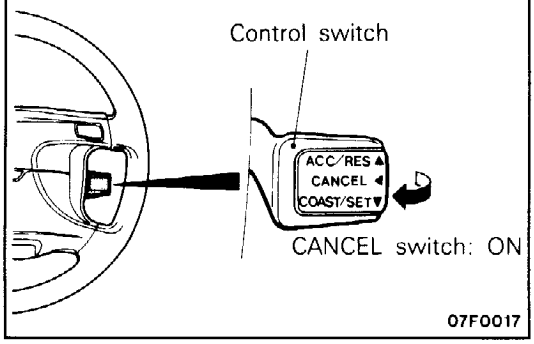
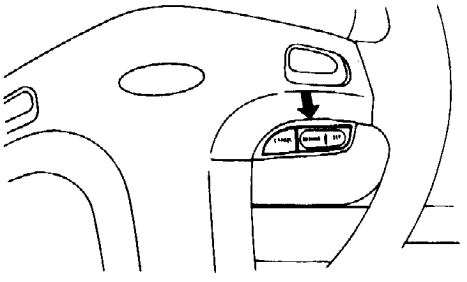


07F0017

CHECK OF RETURN TO THE SET SPEED BEFORE CANCELLATION AND AUTO-CRUISE CONTROL CANCELLATION

(1) Set the auto-cruise speed control.
(2) When any of the following operations are performed while at constant speed during cruise control, check if normal driving is resumed and deceleration occurs.
   ① Switch ON the CANCEL switch.
   ② The brake pedal is depressed.
   ③ The clutch pedal is depressed. (Vehicles with a manual transmission)
   ④ The selector lever is moved to the "N" range. (Vehicles with an automatic transmission)

<Vehicles without SRS>



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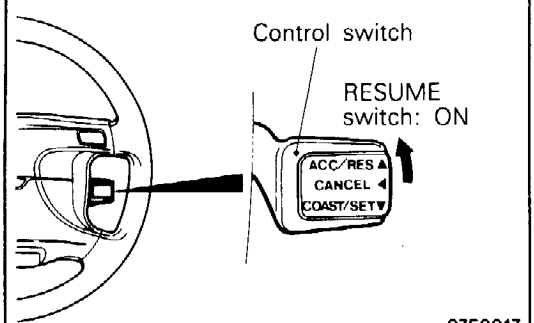


07F0017

(3) At a vehicle speed of 40 km/h (25 mph) or higher, check if when the RESUME switch is switched ON, vehicle speed returns to the speed before cruise control driving was cancelled, and constant speed driving occurs.
(4) When the main switch is turned to OFF while driving at constant speed, check if normal driving is resumed and deceleration occurs.

NOTES

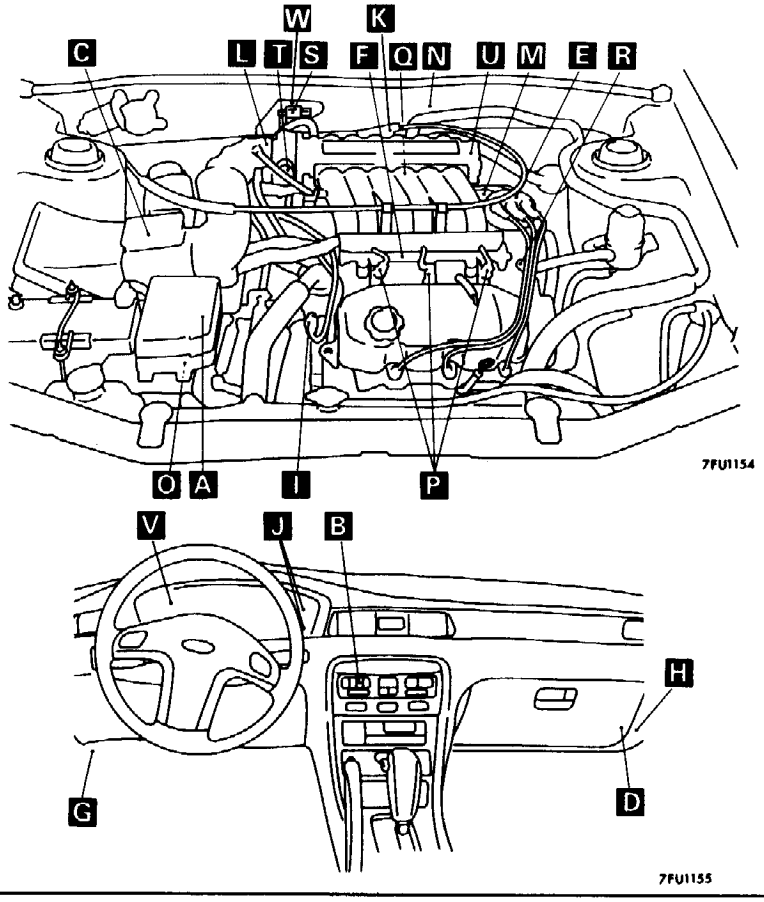
ON VEHICLE INSPECTION OF MPI COMPONENTS

COMPONENTS LOCATION

E13QAAA

<SOHC>

Name	Symbol	Name	Symbol
Air conditioner relay	A	Idle speed control servo	L
Air conditioner switch	B	Ignition coil (power transistor)	M
Air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	C	Ignition timing adjustment terminal	N
		Inhibitor switch	O
		Injector	P
Control relay	D	Oxygen sensor	Q
Crank angle sensor	E	Power steering fluid pressure switch	R
Detonation sensor	F	Purge control solenoid valve	S
Diagnosis connector	G	Throttle position sensor (with idle position switch)	T
EGR control solenoid valve <Vehicles built from December, 1992>	W		
Engine control unit	H		
Engine coolant temperature sensor	I	Variable induction control servo and Induction control valve position sensor	U
Engine warning lamp (check engine lamp)	J		
Fuel pump check terminal	K	Vehicle speed sensor (reed switch)	V



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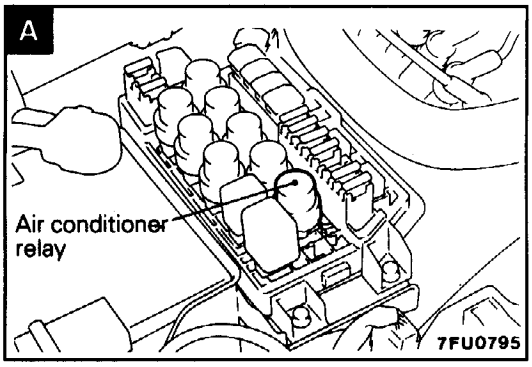

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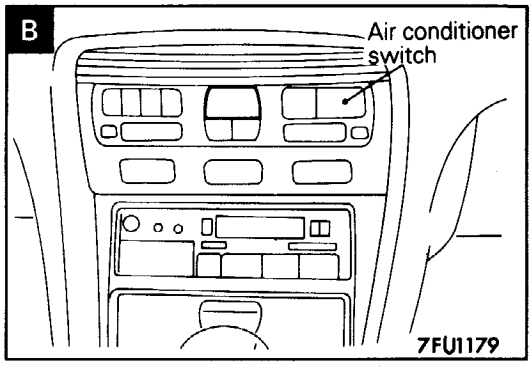

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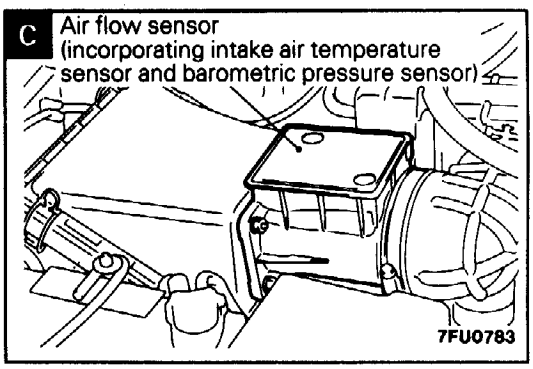

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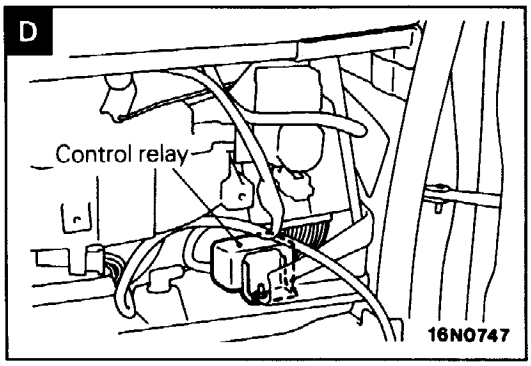

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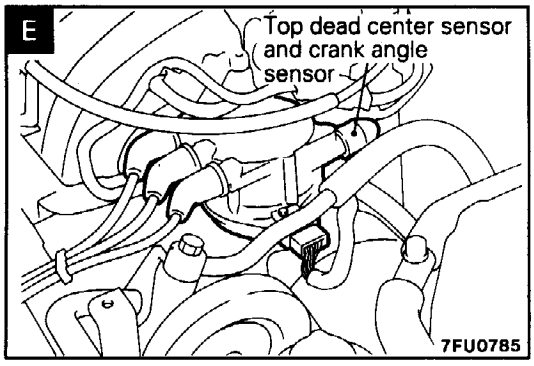

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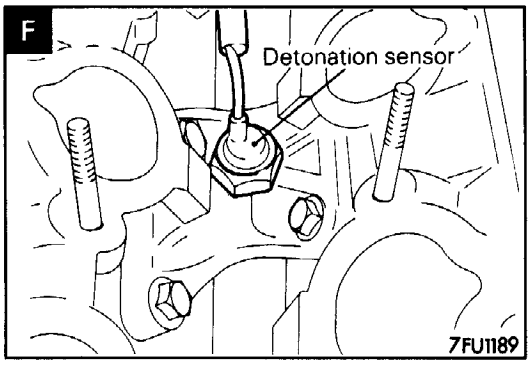

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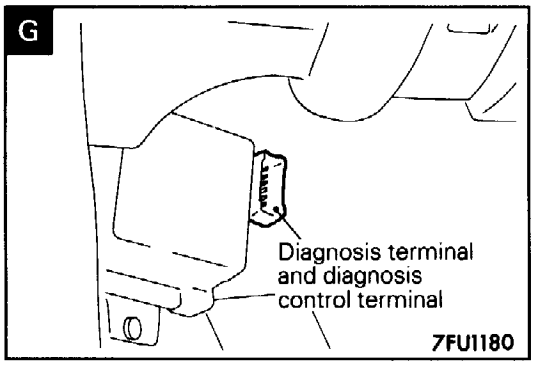

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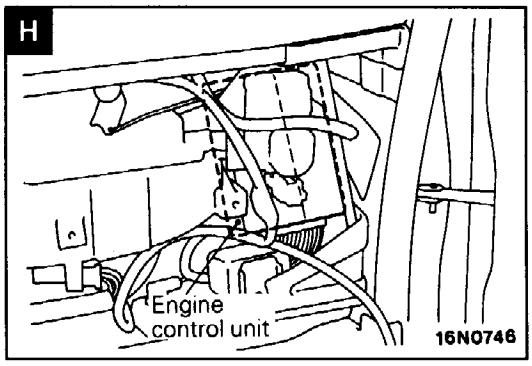

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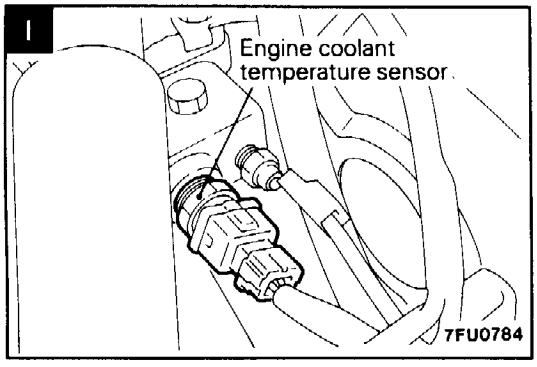

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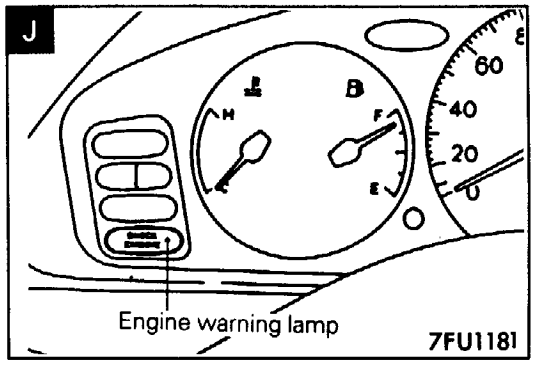

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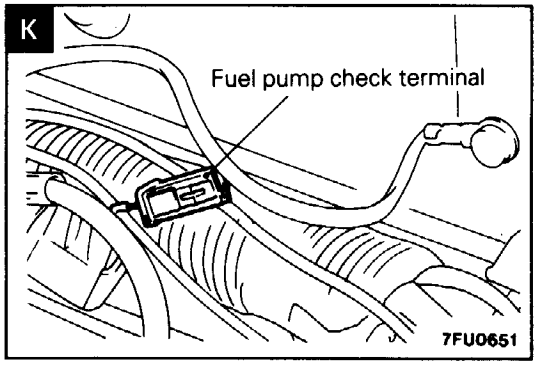

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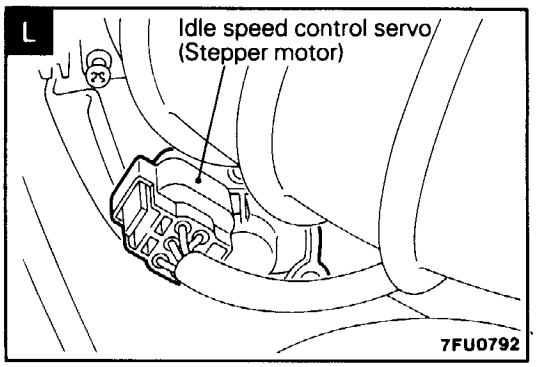

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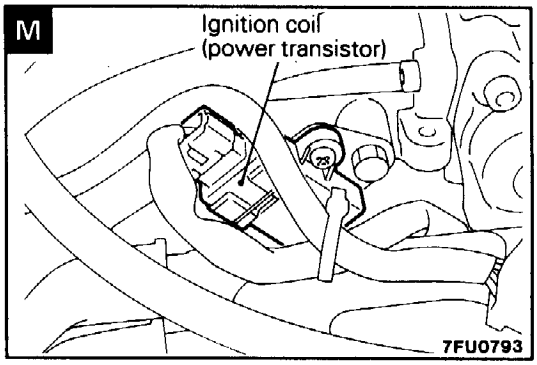

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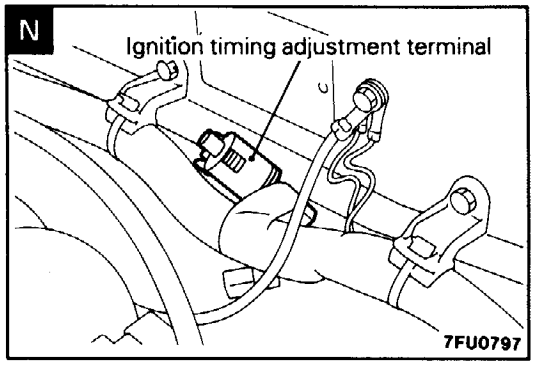

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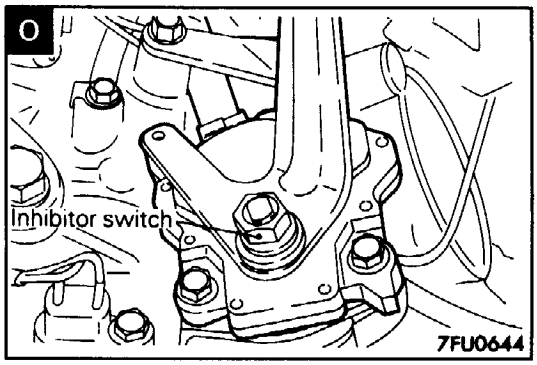

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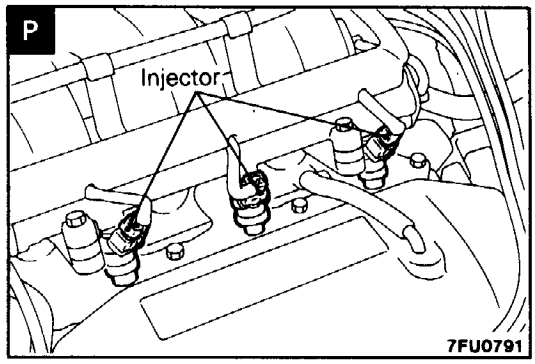

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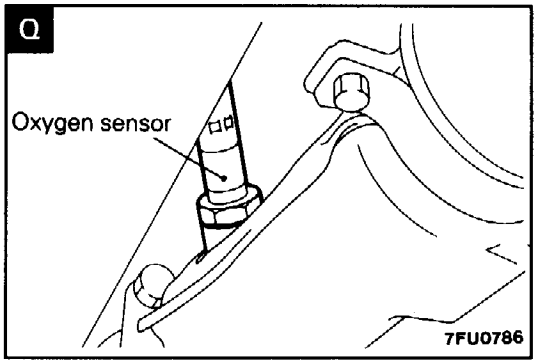

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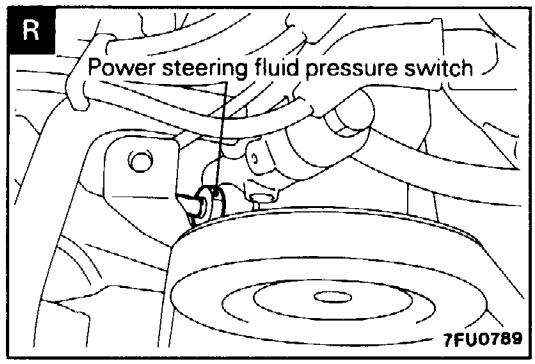

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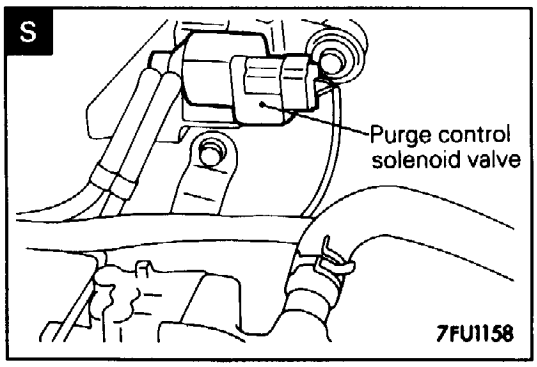

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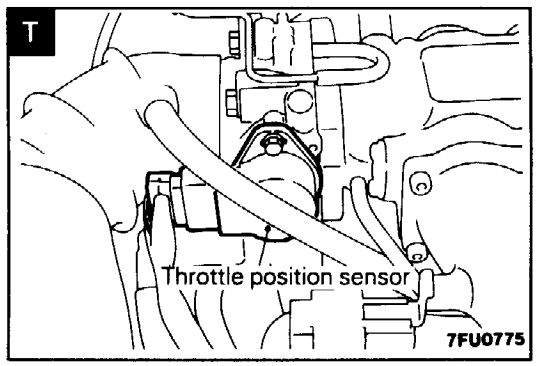
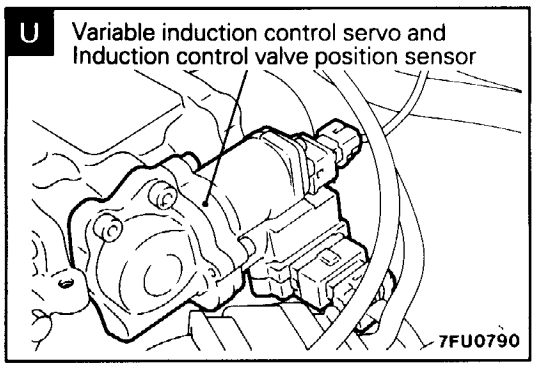
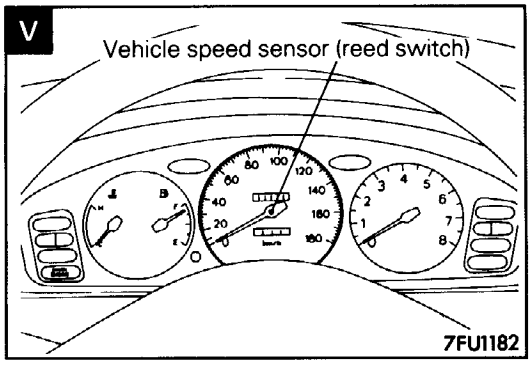


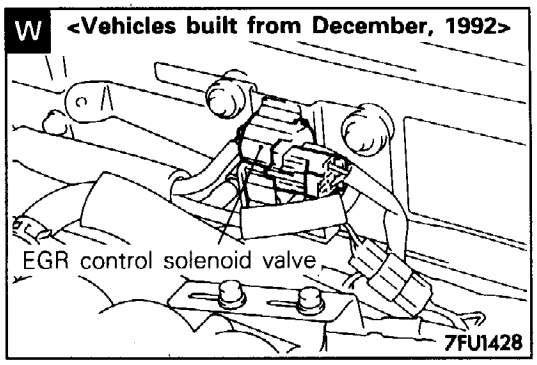
U Variable induction control servo and Induction control valve position sensor



V Vehicle speed sensor (reed switch)



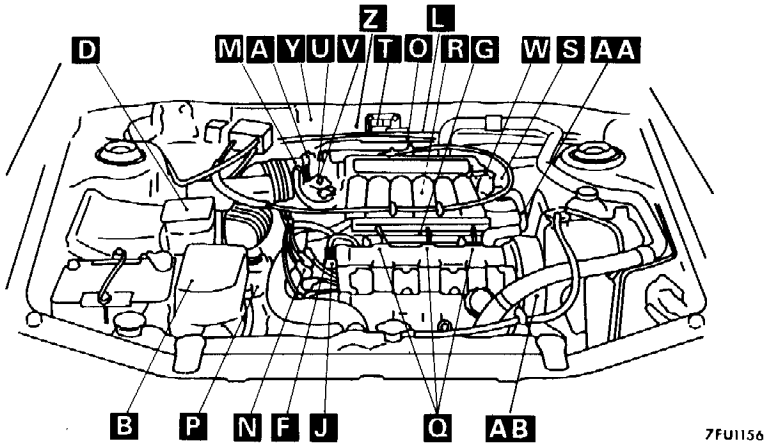
W <Vehicles built from December, 1992>

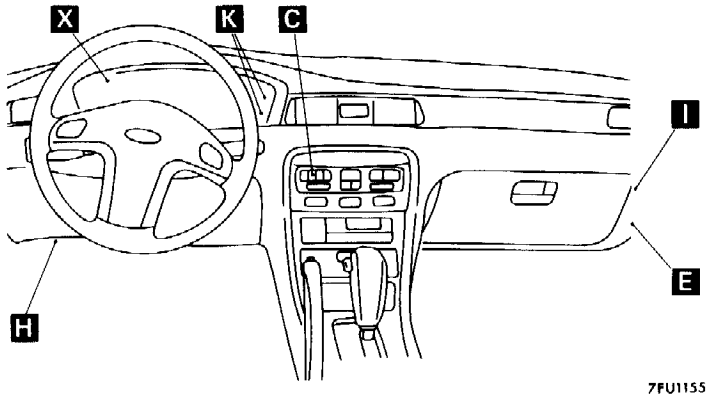


<DOHC>

Name	Symbol
Accelerator position sensor (with idle position switch) <Vehicles with TCL>	A
Air conditioner relay	B
Air conditioner switch	C
Air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	D
Camshaft position sensor <Vehicles built from December, 1992>	AA
Control relay	E
Crank angle sensor <Vehicles built up to November, 1992>	F
Crank angle sensor <Vehicles built from December, 1992>	AB
Detonation sensor	G
Diagnosis connector	H
EGR control solenoid valve <Vehicles built from December, 1992>	Z
Engine control unit	I
Engine coolant temperature sensor	J
Engine warning lamp (check engine lamp)	K
Fuel pump check terminal	L

Name	Symbol
Idle speed control servo	M
Ignition coil (power transistor)	N
Ignition timing adjustment terminal	O
Inhibitor switch	P
Injector	Q
Oxygen sensor	R
Power steering fluid pressure switch	S
Purge control solenoid valve	T
Throttle position sensor <Vehicles with TCL>	U
Throttle position sensor (with idle position switch) <Except for Vehicles with TCL>	V
Variable induction control servo and Induction control valve position sensor	W
Vehicle speed sensor (reed switch)	X
Vacuum control solenoid valve, Purge control solenoid valve and Ventilation control solenoid valve <Vehicles with TCL>	Y





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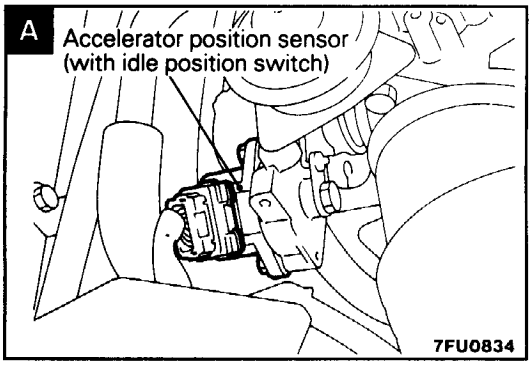

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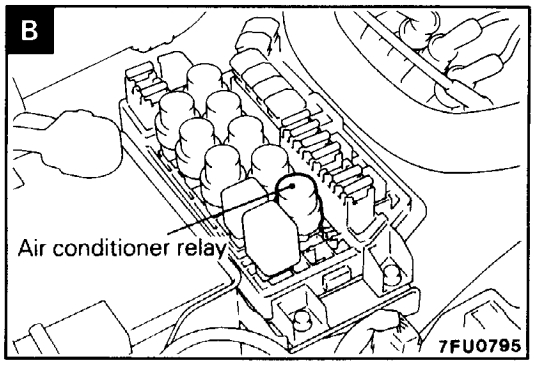

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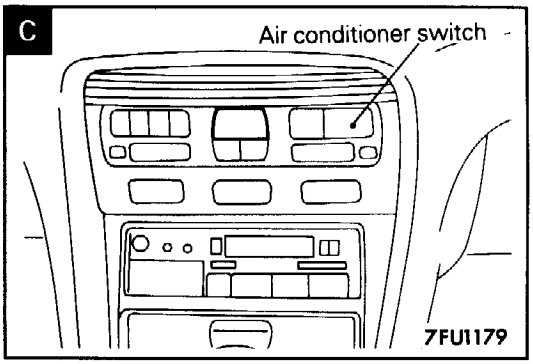

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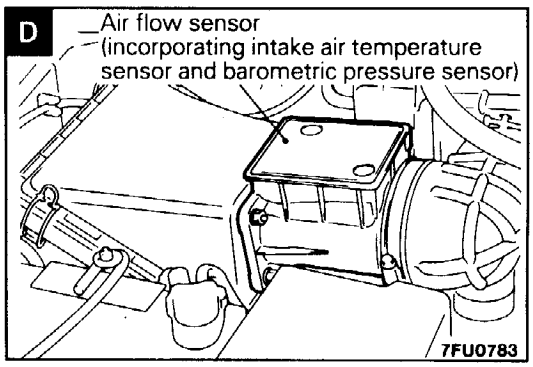

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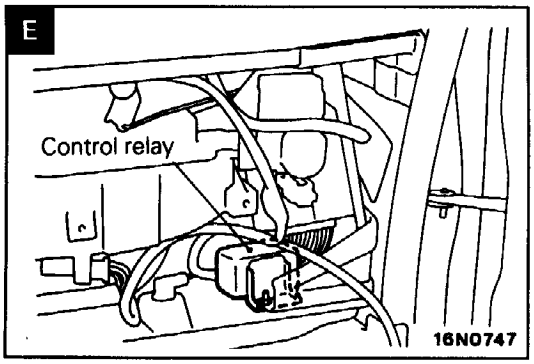

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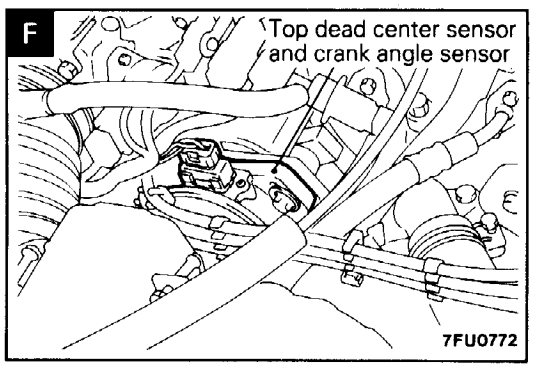

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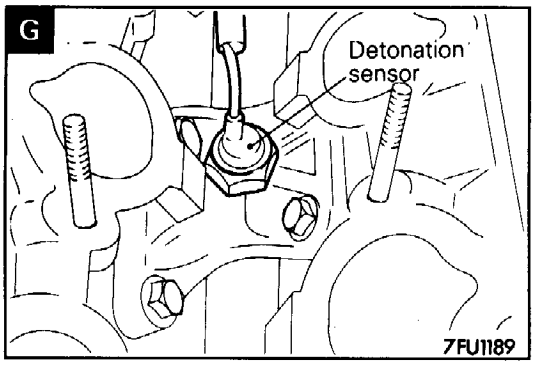

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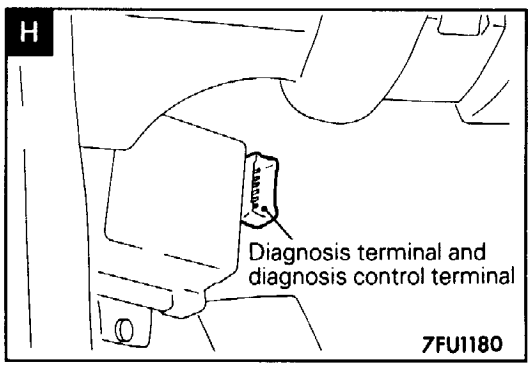

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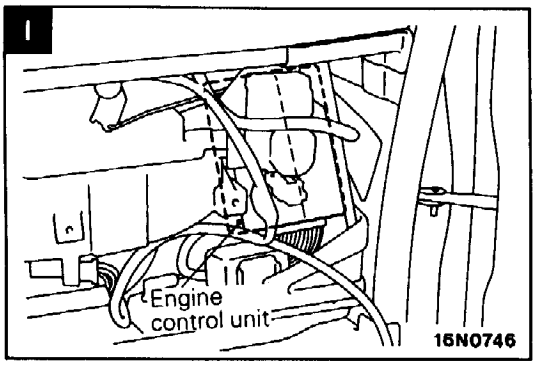

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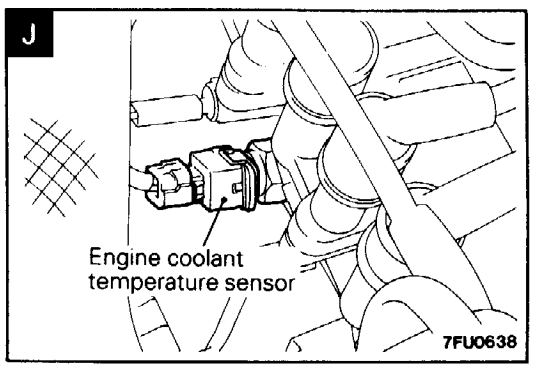

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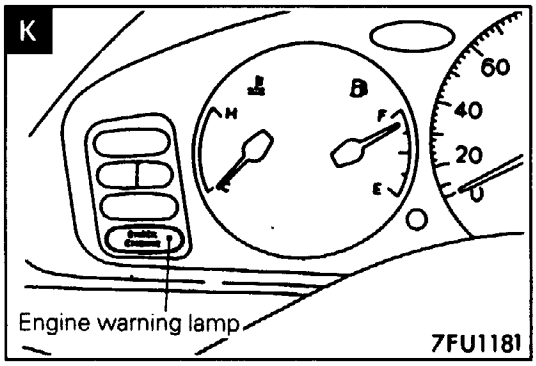

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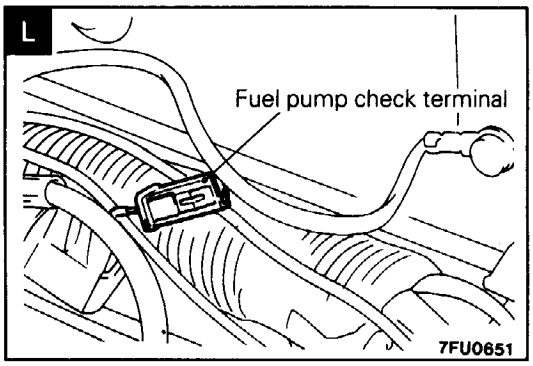

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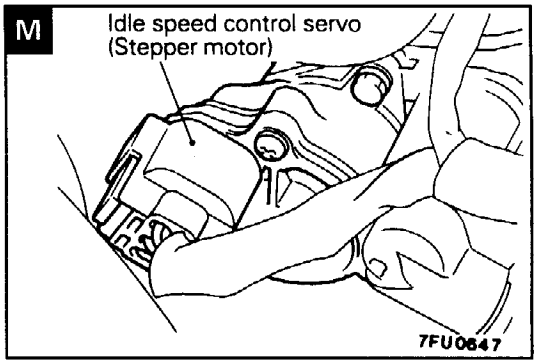

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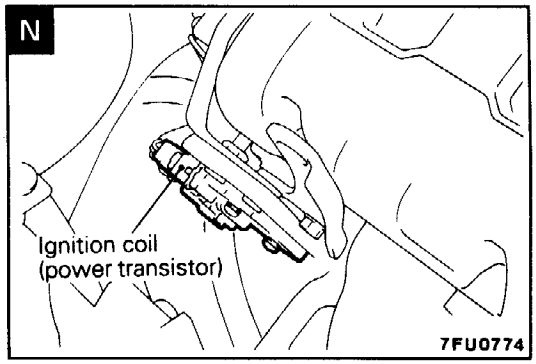

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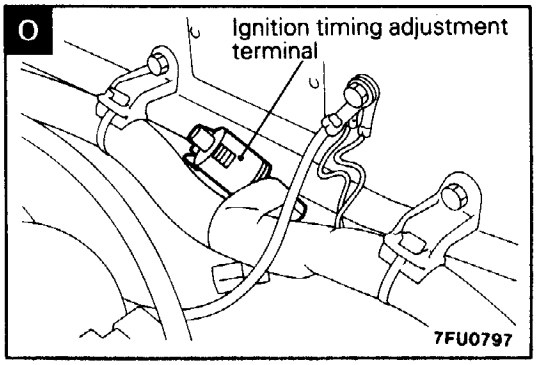

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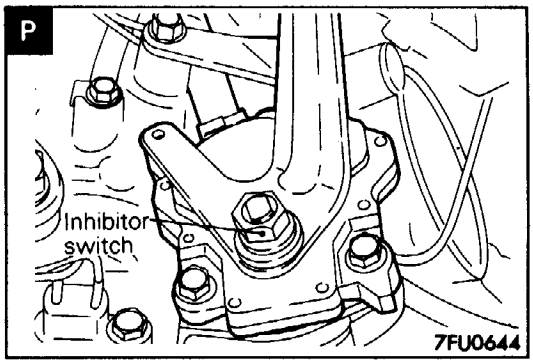

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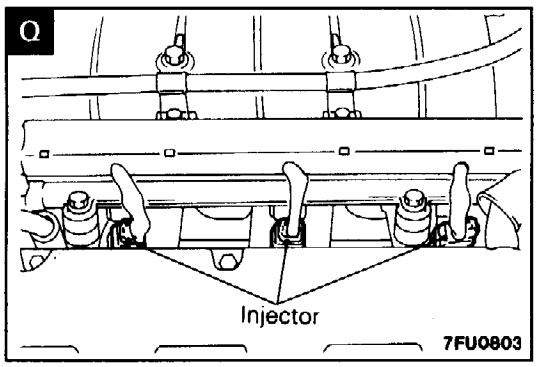

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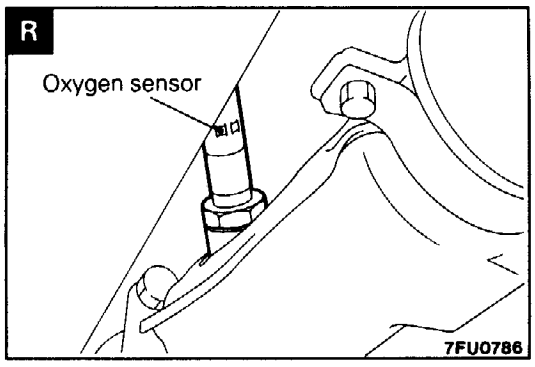

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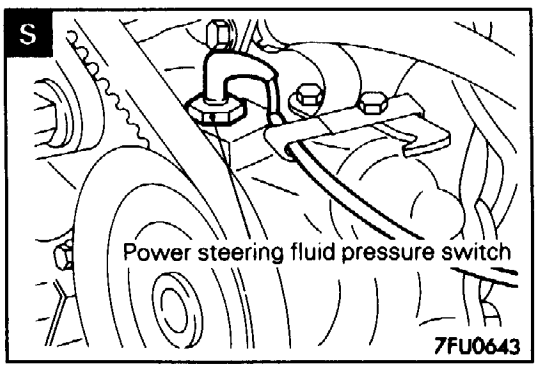
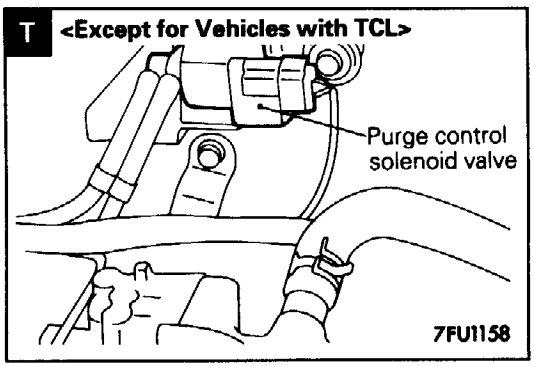


T <Except for Vehicles with TCL>



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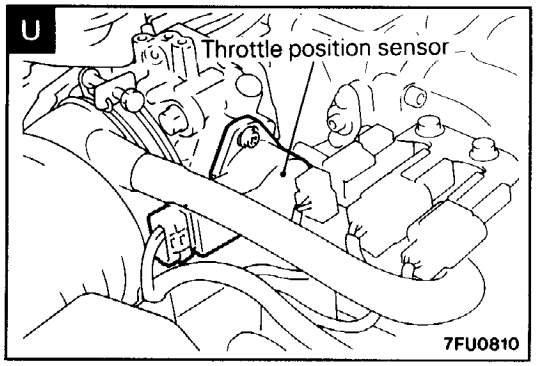

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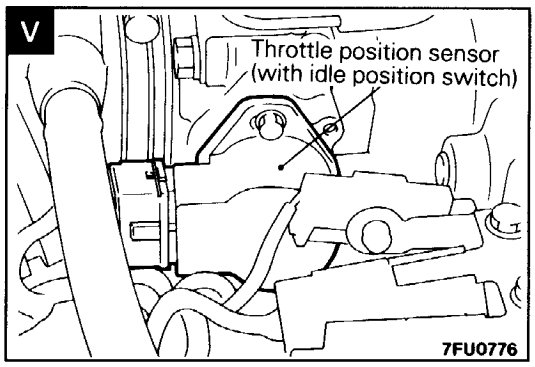

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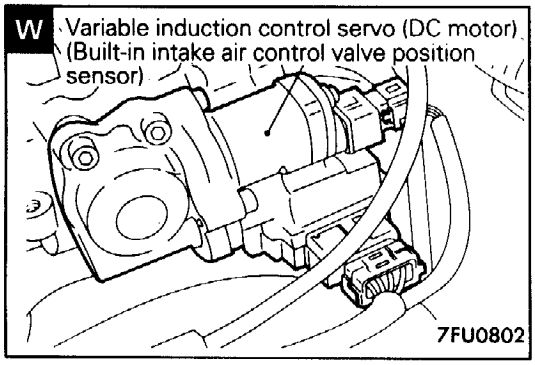

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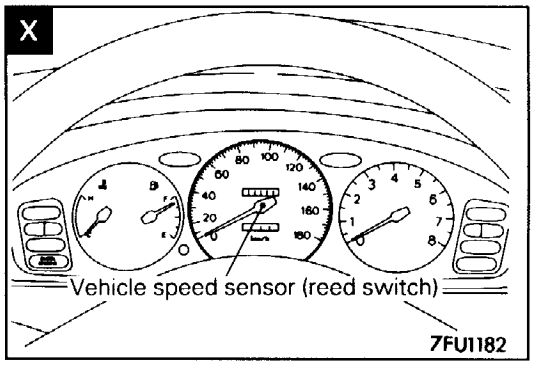

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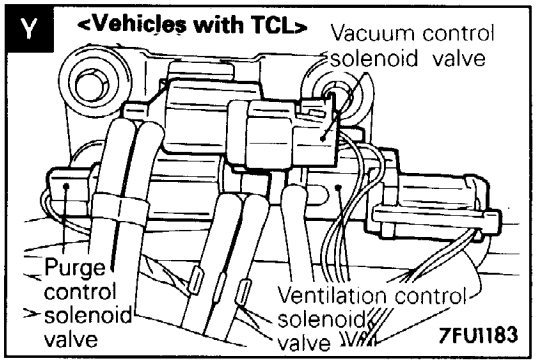

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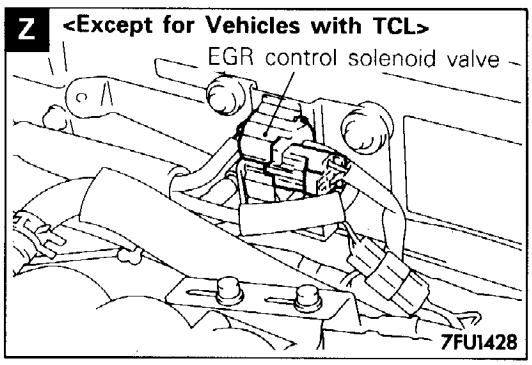

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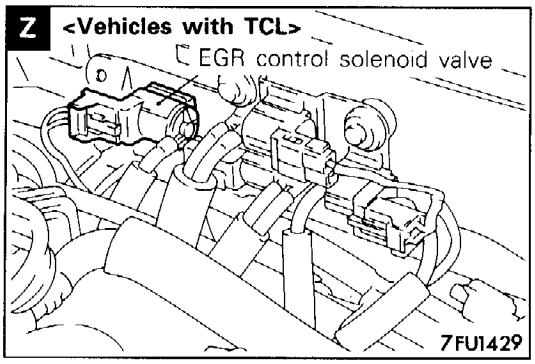

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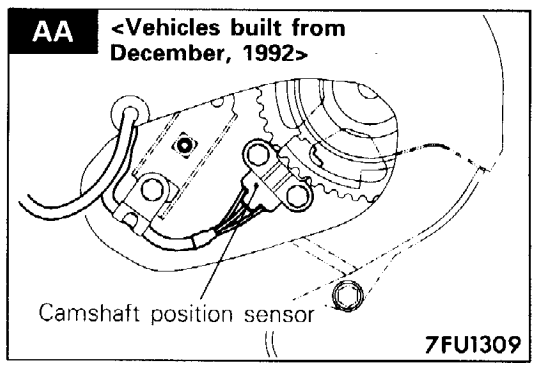
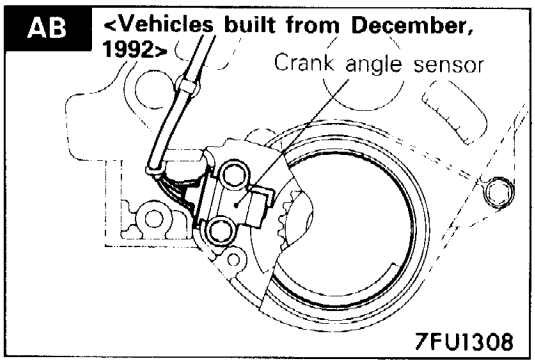
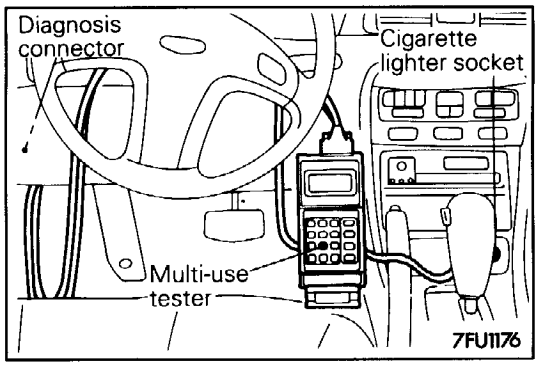


AB





COMPONENT INSPECTION PROCEDURE

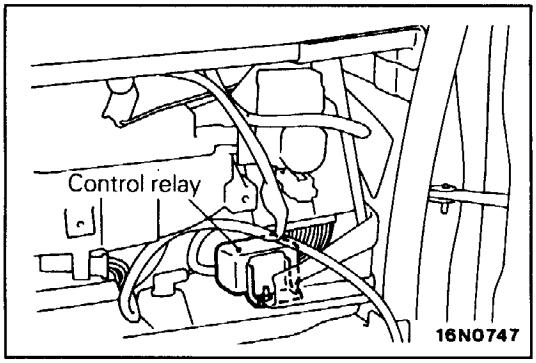
USING MULTI-USE TESTER

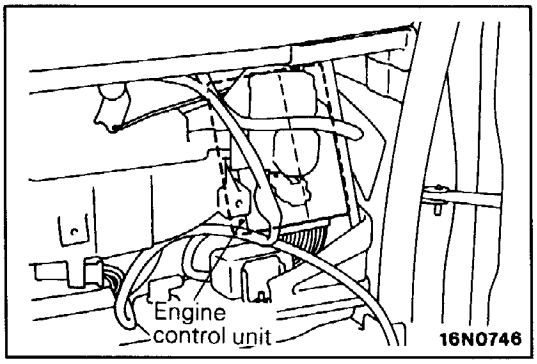
(1) Inspect according to the service data and actuator test function. If there is any abnormality, inspect the body harness and components, etc. and repair.
(2) After repairing, recheck using the multi-use tester to confirm that any I/O abnormalities have been correctly fixed.
(3) Erase the self diagnosis malfunction codes from memory.
(4) Remove the multi-use tester.
(5) Restart the engine, test-drive, etc. to confirm that the trouble has been corrected.

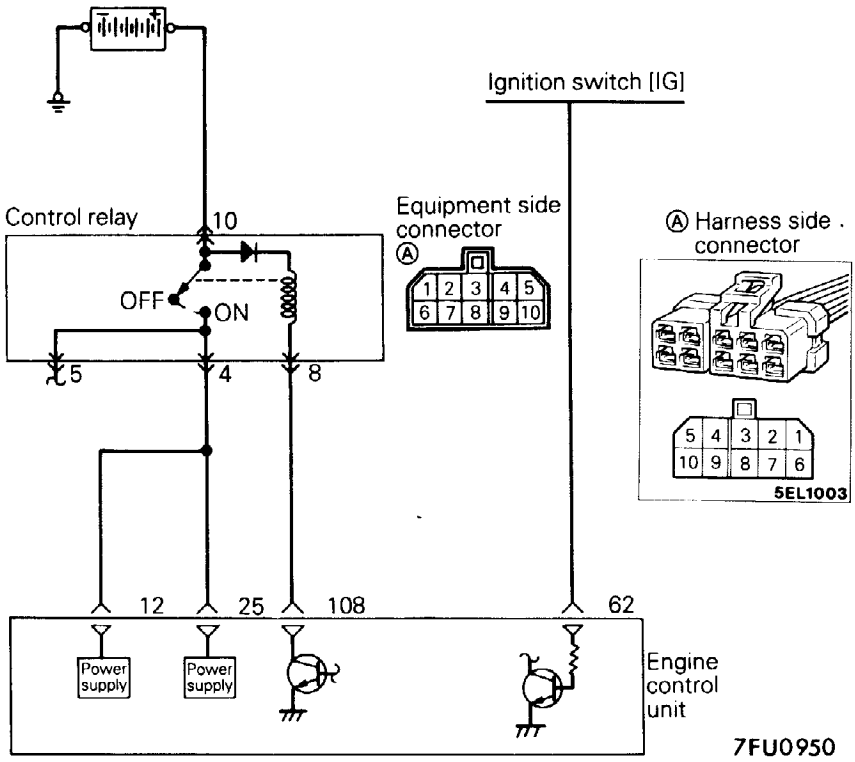
NOTE
Connect the multi-use tester to the white diagnosis connector.

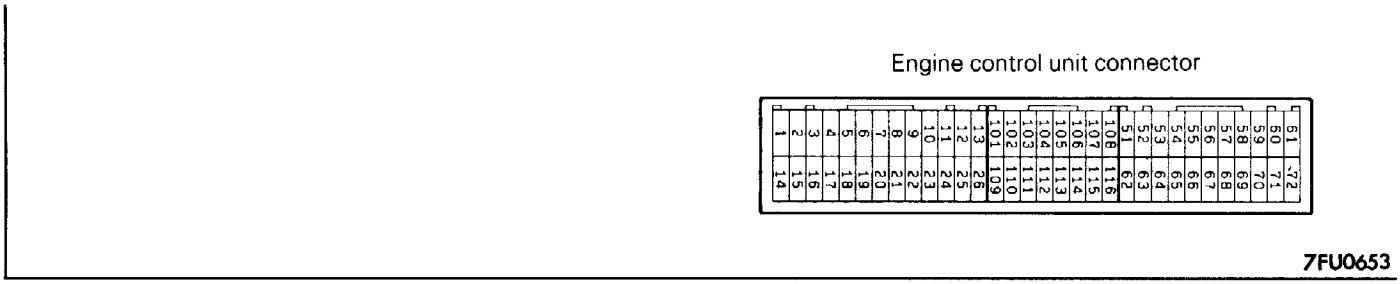
NOTES

POWER SUPPLY AND IGNITION SWITCH-IG
<Vehicles built up to November, 1992>









OPERATION

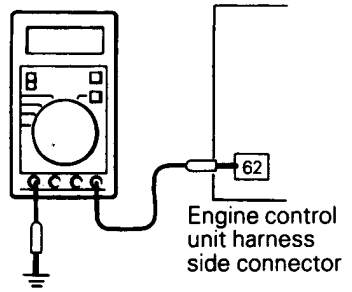
- While the ignition switch is on, battery power is supplied to the engine control unit, the injector, the air flow sensor, etc.
- When the ignition switch is turned on, the battery voltage is applied from the ignition switch to the engine control unit, which then turns ON the power transistor to energize the control relay coil. This turns ON the control relay switch and the power is supplied from the battery to the engine control unit through the control relay switch.

INSPECTION
Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Standard value
Data reading	16	Engine control unit power voltage	Ignition switch: ON	SV

HARNESS INSPECTION

1



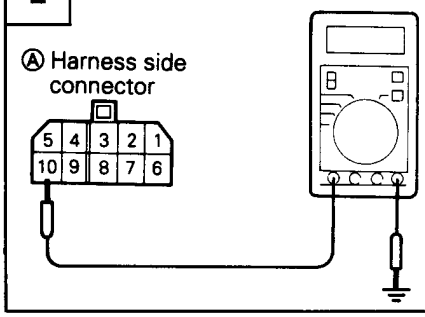
Measure the ignition switch terminal input voltage.
- Engine control unit connector: Disconnected
- Ignition switch: ON

Voltage (V)
SV

OK → 2

NO → Repair the harness. (Ignition switch–62)

2



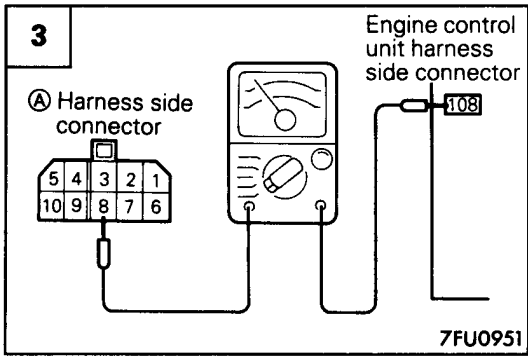
Measure the power supply voltage of the control relay.
- Connector: Disconnected

Voltage (V)
SV

OK → 3

NO → Repair the harness. (Battery–Ⓐ10)

3

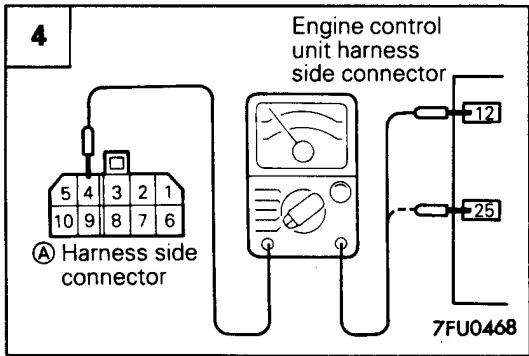


Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the control relay.
- Engine control unit connector: Disconnected
- Control relay connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓐ8–108)

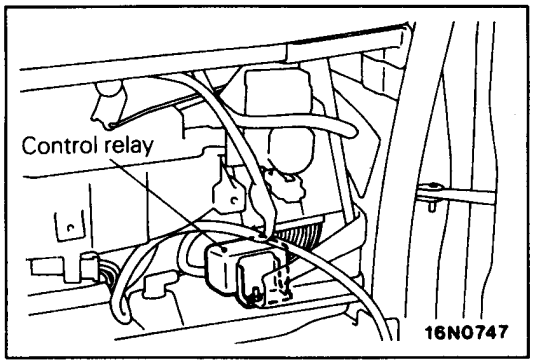
4



Check for an open-circuit, or a short-circuit to earth between the engine control unit and the control relay.
- Control relay connector: Disconnected
- Engine control unit connector: Disconnected

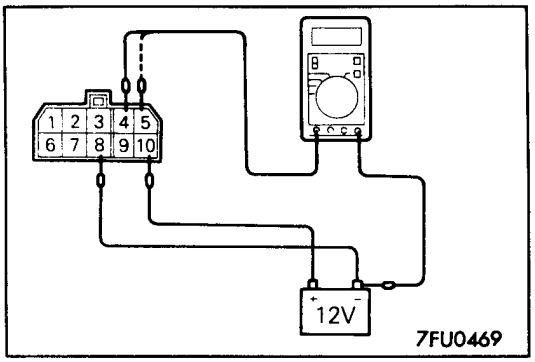
OK → STOP

NO → Repair the harness. (Ⓐ4, –12, 25)



CONTROL RELAY INSPECTION

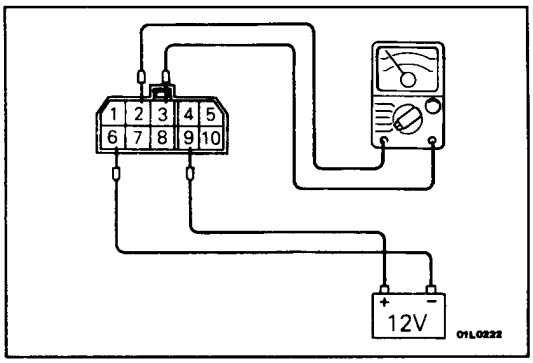
(1) Remove the control relay.



(2) Use jumper wires and connect control relay terminal ⑩ to the battery ⊕ terminal and terminal ⑧ to the battery ⊖ terminal.

Caution
Be very careful when connecting the jumper wires because the relay will be damaged if a mistake is made with the contact terminals.

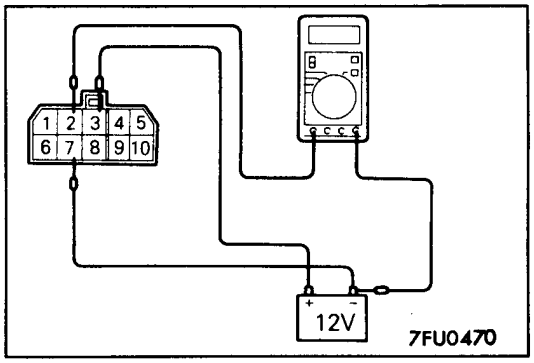
(3) With battery ⊖ terminal jumper wire connected and disconnected, measure the voltage at control relay terminals ④ and ⑤.



Jumper wire	Terminal voltage 4	Terminal voltage 5
Connection	System voltage	System voltage
Not connected	0V	0V

(4) Use jumper wires to connect control relay terminal ⑨ to the battery ⊕ terminal and terminal ⑥ to the battery ⊖ terminal.

(5) With the battery ⊖ terminal jumper wire connected and disconnected, check the continuity between the terminals ② and ③.



Jumper wire	Continuity between terminals 2–3
Connection	Yes
Not connected	No

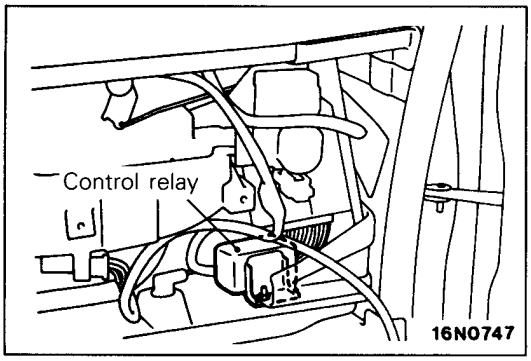
(6) Use jumper wires and connect control relay terminal ③ to the battery ⊕ terminal and terminal ⑦ to the battery ⊖ terminal.

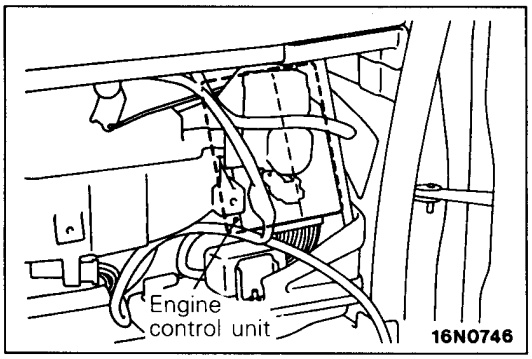
(7) With the battery ⊖ terminal jumper wire connected and disconnected, measure the voltage at control relay terminal ②.

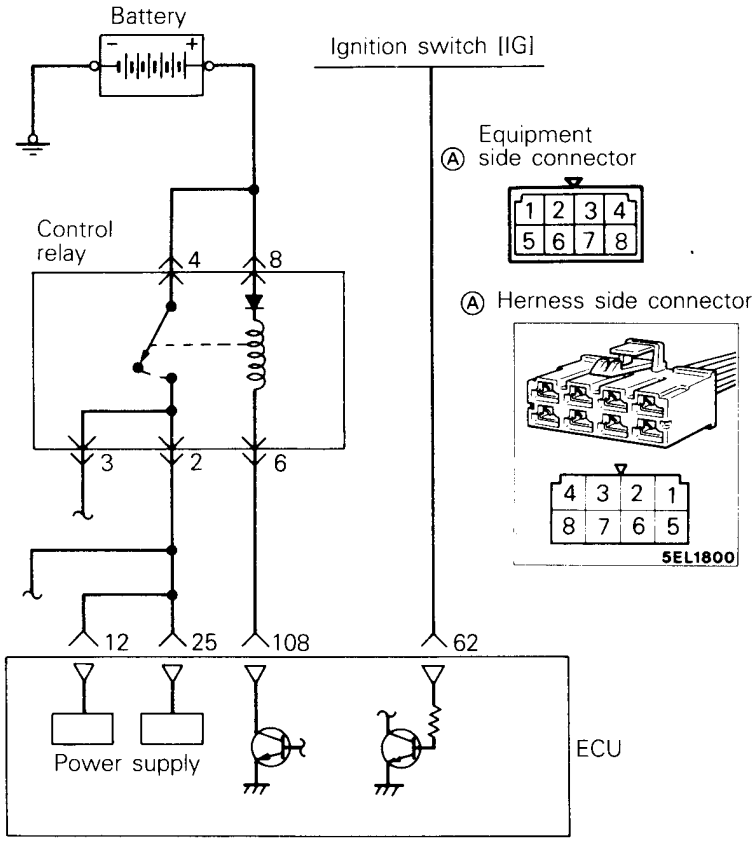
Jumper wire	Terminal Voltage 2
Connection	System voltage
Not connected	0V

(8) Replace the control relay if faulty.

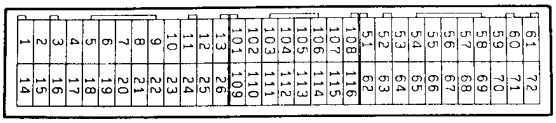
POWER SUPPLY AND IGNITION SWITCH-IG <Vehicles built from December, 1992>







ECU connector



7FU0653

1FU0807

OPERATION

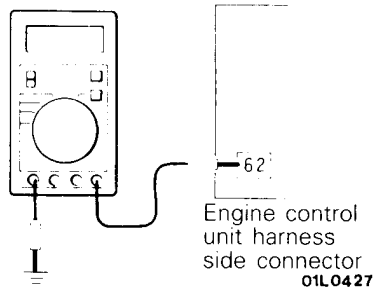
Refer to P.13-64

INSPECTION

Using Multi-use Tester (MUT)
Refer to P.13-64

HARNESS INSPECTION

1



Measure the ignition switch terminal input voltage.

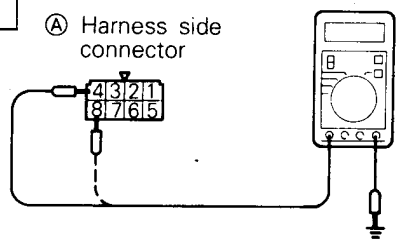
- Engine control unit connector: Disconnected

Ignition switch	Voltage (V)
OFF	0–1
ON	Battery voltage

OK → 2

NG → Repair the harness. (Ignition switch – 62) or check the ignition switch.

2



1FU0808

Measure the power supply voltage of the control relay.

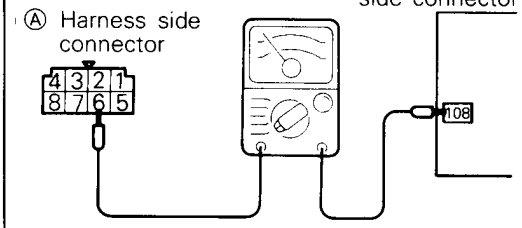
- Ignition switch: OFF
- Control relay connector: Disconnected

Voltage (V)
Battery voltage

OK → 3

NO → Repair the harness. (Battery – Ⓐ4) (Battery – Ⓐ8)

3



1FU0809

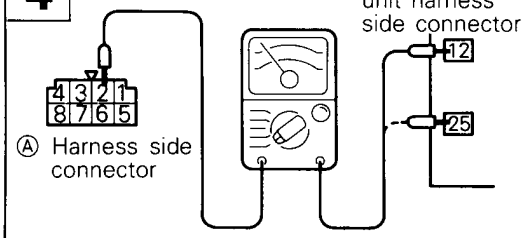
Check for open-circuit, or short-circuit to earth, between the engine control unit and the control relay.

- Engine control unit connector: Disconnected
- Control relay connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓐ6 – 108)

4



6AF0050

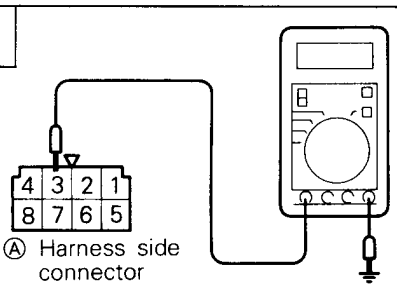
Check for open-circuit, or short-circuit to earth, between the engine control unit and the control relay.

- Engine control unit connector: Disconnected
- Control relay connector: Disconnected

OK → STOP

NO → Repair the harness. (Ⓐ2 – 12 25)

5



6AF0051

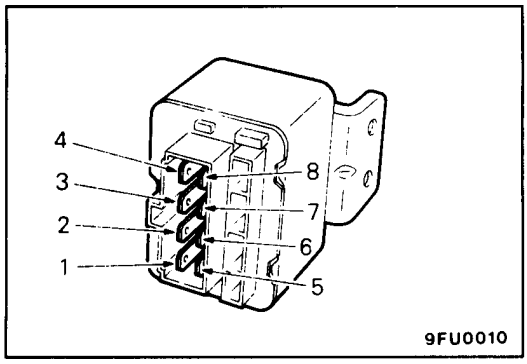
Measure the power voltage to the actuator.

- Control relay connector: Connected
- Engine control relay connector: Connected

Engine	Voltage (V)
Cranking	8V or more
Racing	Battery voltage

OK → STOP

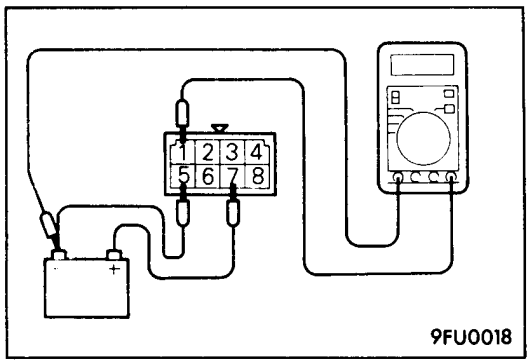
NO → Replace the control relay or engine control unit is defective



CONTROL RELAY INSPECTION

(1) Remove the control relay.
(2) Check the continuity between the control relay terminals.

Inspection terminals	Continuity
5–7	Continuity
6–8	Continuity in one direction

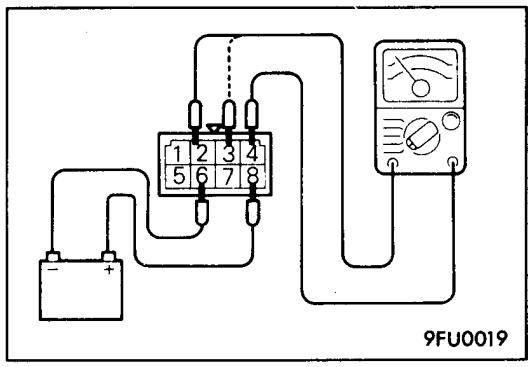


(3) Use jumper leads to connect control relay terminal ⑦ to the battery (+) terminal and terminal ⑤ to the battery (–) terminal.

Caution
When connecting the jumper leads, be careful not to mistake the connection terminals, as damage to the relay will result.

(4) Check the voltage at control relay terminal ① while connecting and disconnecting the jumper lead at the battery (–) terminal.

Jumper lead	Voltage at terminal 1
Connected	SV
Disconnected	0V



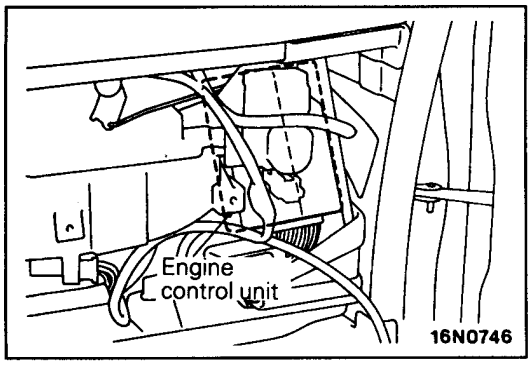
(5) Use the jumper leads to connect control relay terminal ⑧ to the battery (+) terminal and terminal ⑥ to the battery (–) terminal.
(6) Check the continuity between control relay terminals ② – ④ and terminals ③ – ④ while connecting and disconnecting the jumper lead at the battery (–) terminal.

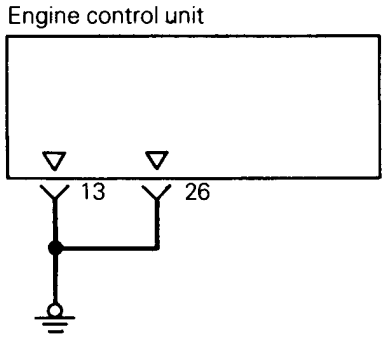
Jumper lead	Continuity between terminals 2 – 4	Continuity between terminals 3 – 4
Connected	Continuity (0Ω)	Continuity (0Ω)
Disconnected	No continuity (∞Ω)	No continuity (∞Ω)

(7) If there is a defect, replace the control relay.

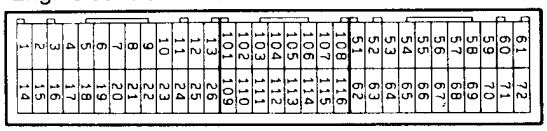
NOTES

ENGINE CONTROL UNIT POWER EARTH





Engine control unit connector



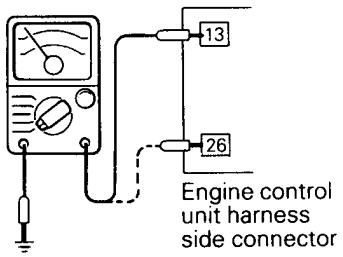
OPERATION

Earth the engine control unit

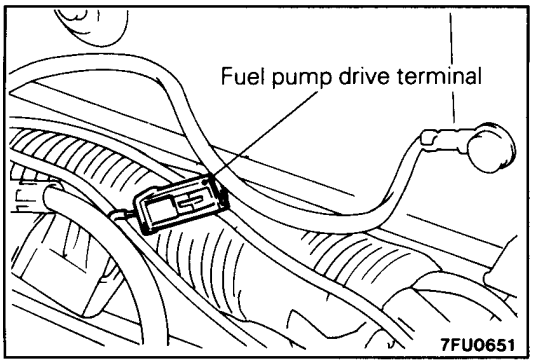
TROUBLESHOOTING HINTS

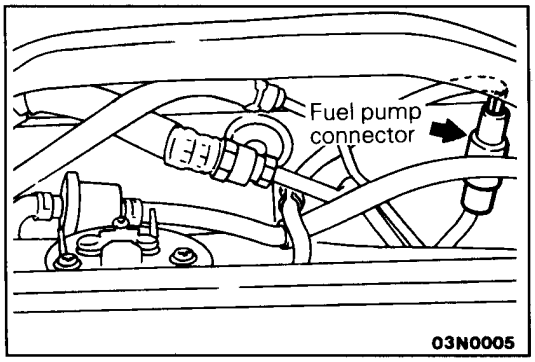
If the earth wire of the engine control unit is not connected securely to earth, the unit will not operate correctly.

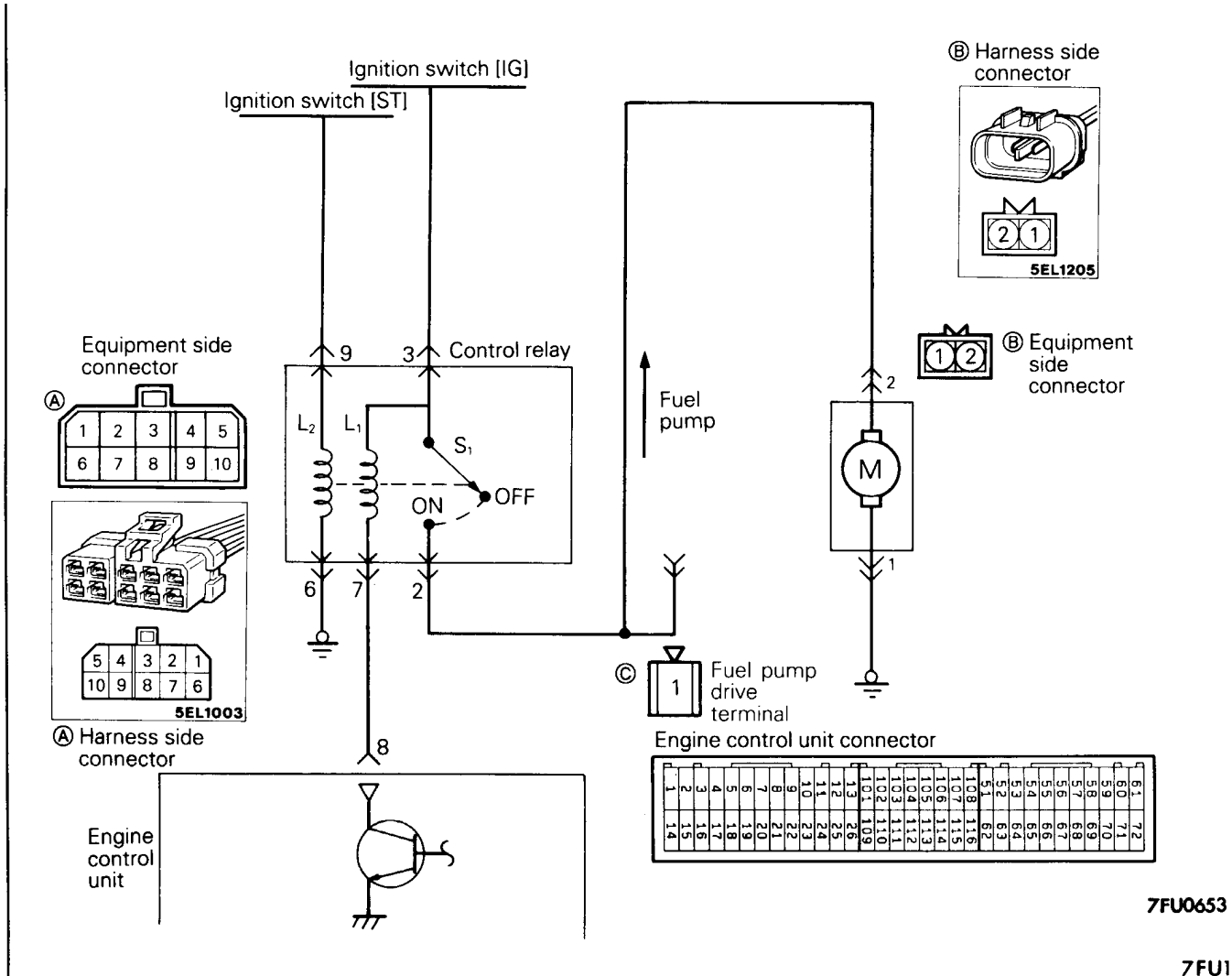
HARNESS INSPECTION

1		Check for continuity of the earth circuit. • Engine control unit connector: Disconnected	OK → STOP NG → Repair the harness. (13, 26 – Earth)

FUEL PUMP <Vehicles built up to November, 1992>







OPERATION

- Drives the fuel pump during cranking and engine operation.
- When the ignition switch is set to START, current flows from the ignition switch through the control relay coil to earth. This turns on the control relay switch and drive power is supplied from the battery through the control relay switch to the fuel pump.
- While the engine is running, the engine control unit keeps the power transistor on and energizes the control relay coil so that drive power is supplied to the fuel pump.
- When the control relay switch is turned on, battery voltage is also applied to the engine control unit so that the control unit detects supply of drive power to the fuel pump.

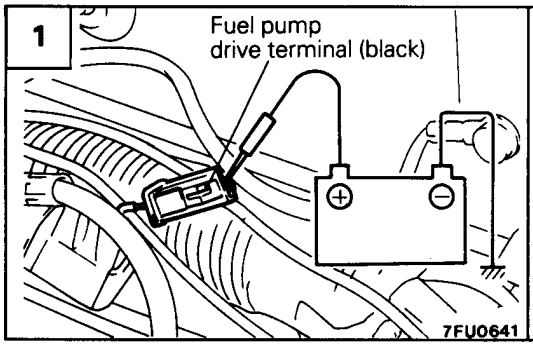
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Drive	Check condition	Check content	Normal state
Actuator test	07	Fuel pump is driven to circulate fuel	• Engine cranking • Forced drive of fuel pump Check is made for above two conditions	Hold return hose with fingers to feel pulsation indicating fuel flow	Pulsation is felt
				Listen to pump operating sound near fuel tank	Operating sound is heard

HARNESS INSPECTION

1

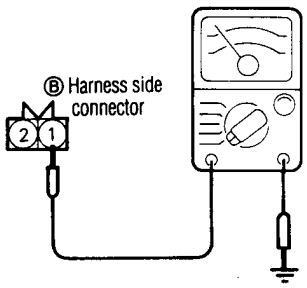


Check the fuel pump.
- Apply battery voltage to the check terminal and operate the pump.

OK → 4

NO → 2

2

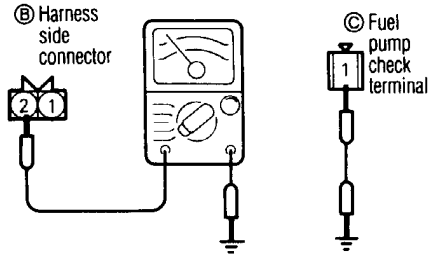


Check the earth circuit of the fuel pump.
- Connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓑ1 – Earth)

3

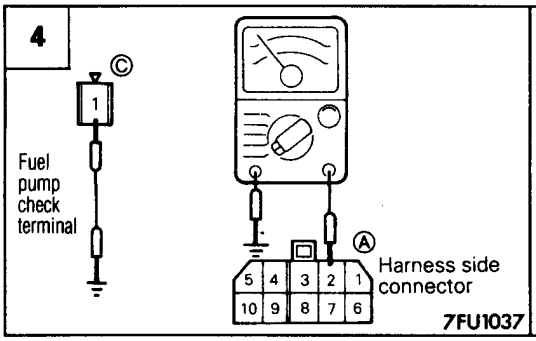


Check for continuity between the fuel pump and the check terminal.
- Connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓑ2 – Ⓒ1.)

4

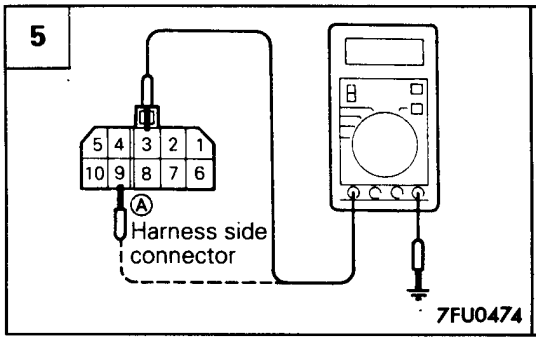


Check for continuity between the check terminal and the control relay terminals.
- Control relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → 5

NO → Repair the harness. (A2–C1)

5



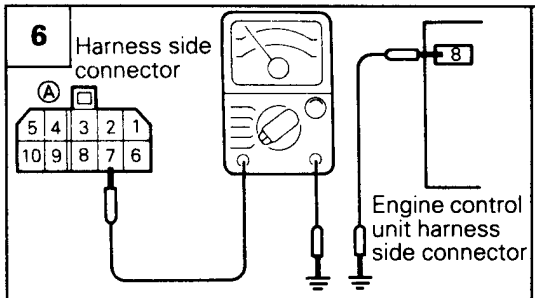
Measure the power supply voltage of the control relay.
- Connector: Disconnected
- Ignition switch: START (when A9 checked)
- Ignition switch: ON (when A3 checked)

Voltage (V)
8 or more

OK → 6

NO → Repair the harness. (Ignition switch-IG–A3) (Ignition switch-ST–A9)

6

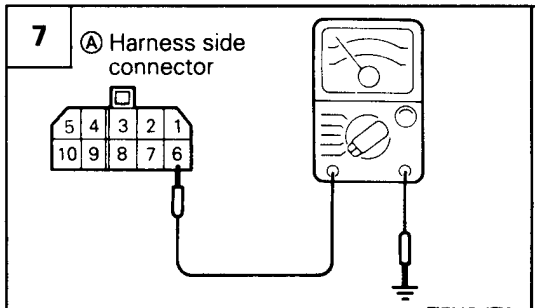


Check for an open-circuit, or a short-circuit to earth between the control relay and the engine control unit.
- Control relay connector: Disconnected
- Engine control unit connector: Disconnected

OK → 7

NO → Repair the harness. (A7–8)

7

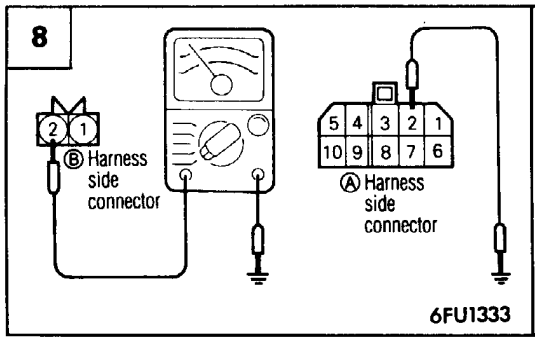


Check for continuity of the earth circuit.
- Control relay connector: Disconnected

OK → 8

NO → Repair the harness. (A6–Earth)

8



Check for an open-circuit, or a short-circuit to earth between the control relay and the fuel pump.
- Control relay connector: Disconnected
- Fuel pump connector: Disconnected

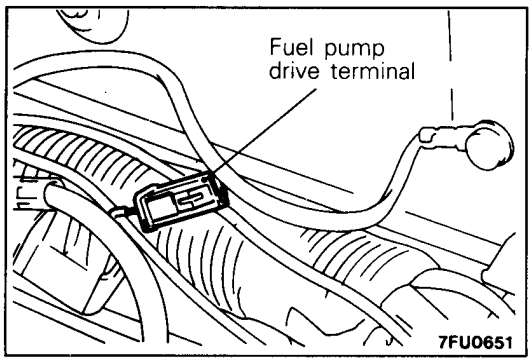
OK → STOP

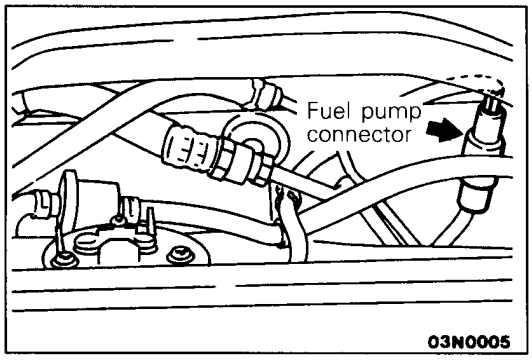
NO → Repair the harness. (A2–B2.)

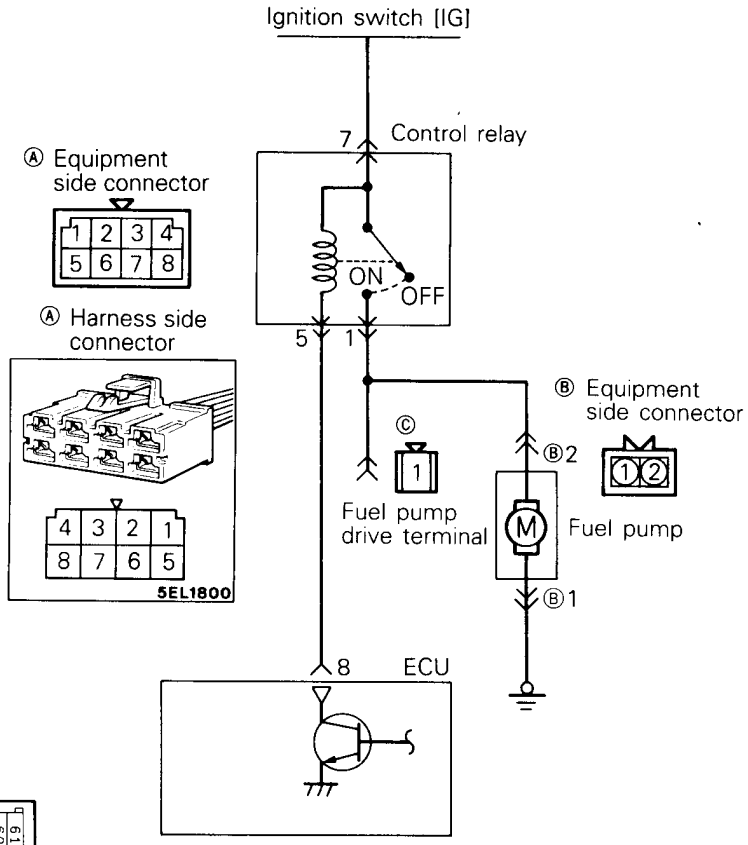
CONTROL RELAY INSPECTION

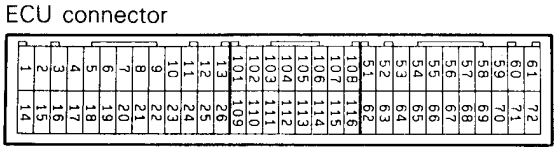
Refer to P.13-66.

FUEL PUMP <Vehicles built from December, 1992>









7FU0653

6AF0159

OPERATION

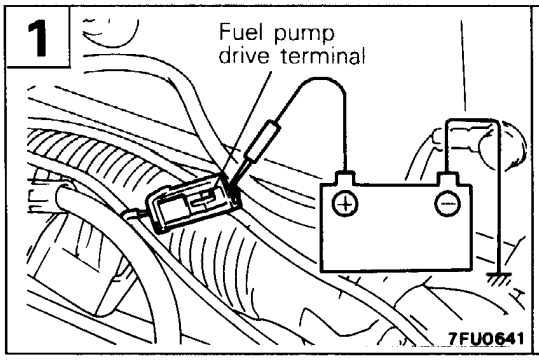
- The fuel pump is driven when the engine is cranking and while the engine is running.
- When the engine is cranking and while the engine is running, the engine control unit turns the power transistor ON to supply power to the control relay coil. This causes the control relay switch to turn ON, and current is supplied from the ignition switch via the control relay switch to drive the fuel pump.

INSPECTION

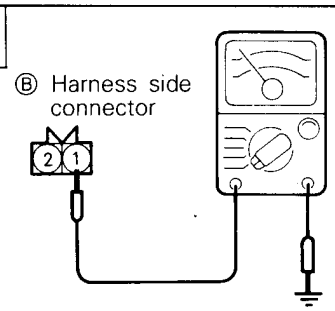
Using Multi-use Tester (MUT)

Refer to P. 13-69

HARNESS INSPECTION

1		Check the fuel pump. • Apply battery voltage to the fuel pump drive terminal and operate the pump.	OK → 4 NG → 2

2



1FU0521

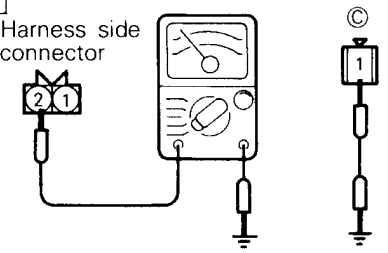
Check for continuity of the fuel pump earthing line.

- Fuel pump intermediate connector: Disconnected

OK → 3

OK → Repair the harness. (Ⓑ1 – Earth)

3



1FU0522

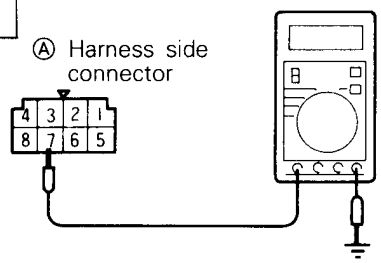
Check for open-circuit or short-circuit between the fuel pump and the fuel pump drive terminal.

- Fuel pump intermediate connector: Disconnected
- Control relay connector: Disconnected

OK → 4

OK → Repair the harness. (Ⓑ2 – Ⓒ1)

4



9FU0023

Measure the power supply voltage of the control relay.

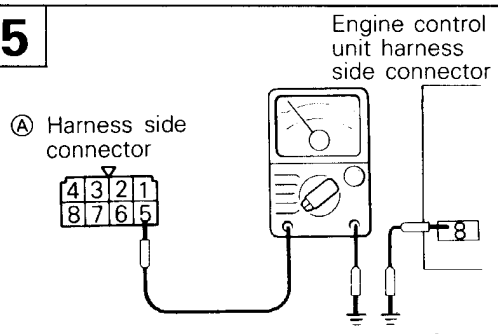
- Control relay connector: Disconnected

Ignition switch	Voltage (V)
OFF	0–1
START	Battery voltage

OK → 5

OK → Repair the harness. (Ignition switch – Ⓐ7) or check for ignition switch.

5



01A0354

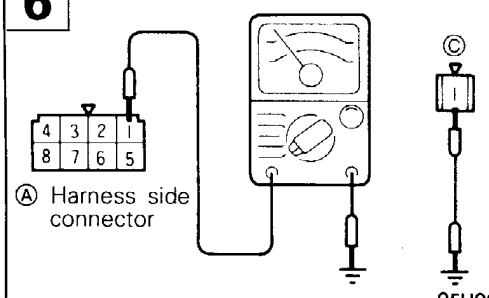
Check for an open-circuit, or a short-circuit to earth between the control relay and the engine control unit.

- Control relay connector: Disconnected
- Engine control unit connector: Disconnected

OK → 6

OK → Repair the harness. (Ⓐ5 – 8)

6



9FU0024

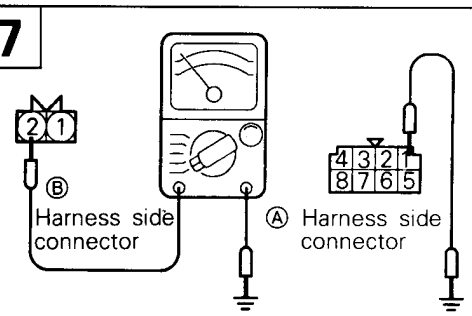
Check for continuity between the fuel pump drive terminal and the control relay.

- Control relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → 7

OK → Repair the harness. (Ⓐ1 – Ⓒ1)

7



6AF0162

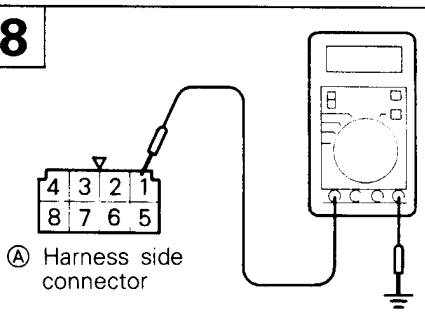
Check for an open-circuit, or a short-circuit to earth between the control relay and the fuel pump.

- Control relay connector: Disconnected
- Fuel pump intermediate connector: Disconnected

OK → 8

NG → Repair the harness. (Ⓐ1 – Ⓑ2)

8



6FU1753

Measure the power supply voltage of the fuel pump.

- Control relay connector: Connected
- Engine control unit connector: Connected

Engine	Voltage (V)
Cranking	8V or more
Racing	Battery voltage

OK → STOP

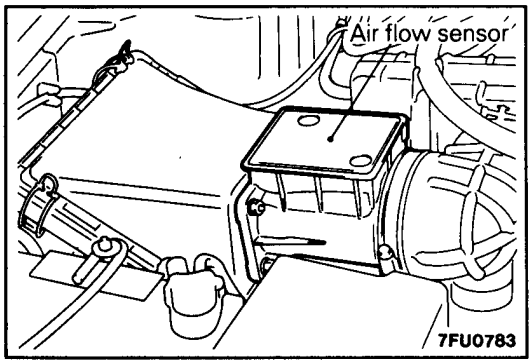
NG → Control relay or engine control unit is defective.

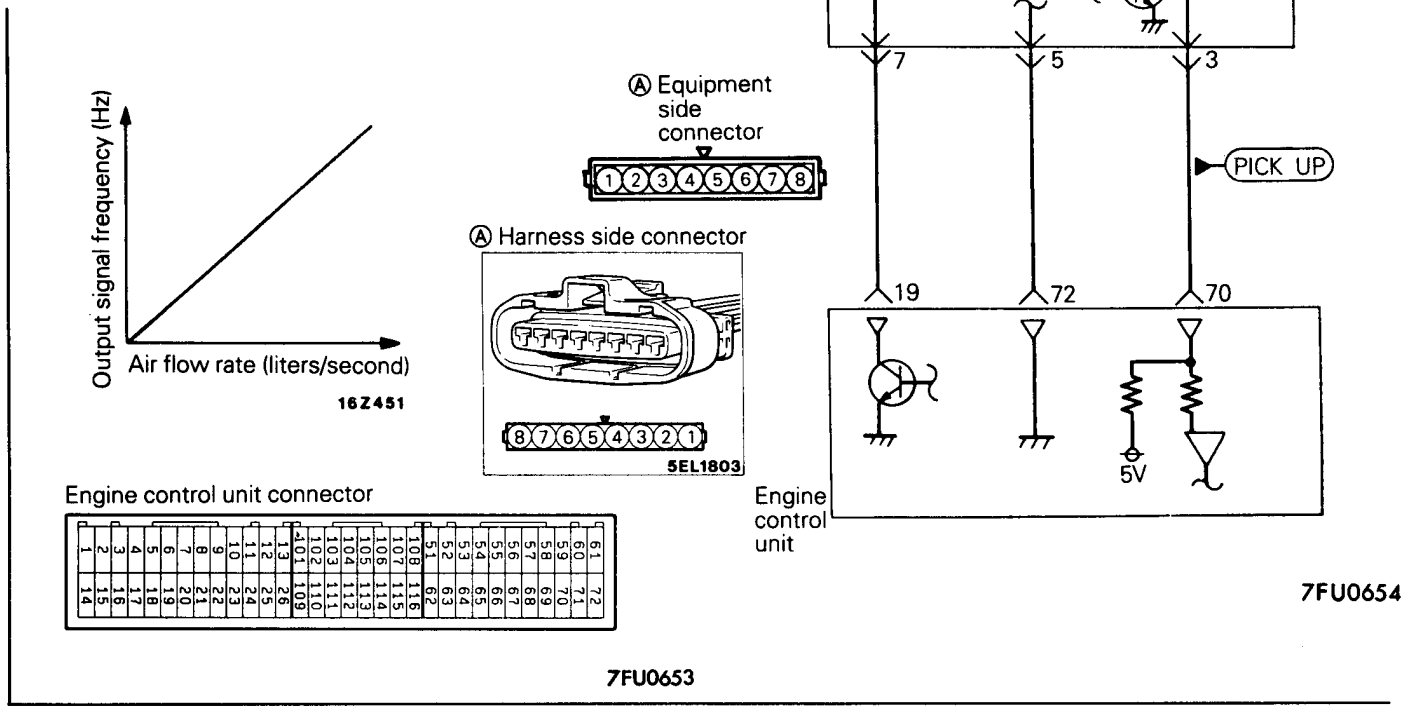
CONTROL RELAY INSPECTION

Refer to P. 13-66-3

NOTE

AIR FLOW SENSOR





OPERATION

- The air flow sensor located in the air cleaner converts the engine intake air volume into a pulse signal of frequency proportional to the air volume and inputs it to the engine control unit, which then computes the fuel injection rate, etc. based on the input signal.
- The air flow sensor power is supplied from the control relay to the air flow sensor and is earthed in the engine control unit. The air flow sensor generates a pulse signal as it repeatedly opens and closes between the 5 V voltage supplied from the engine control unit and earth.

TROUBLESHOOTING HINTS

Hint 1: If the engine stalls occasionally, crank the engine and shake the air flow sensor harness. If the engine stalls, poor contact of the air flow sensor connector is suspected.

Hint 2: If the air flow sensor output frequency is other than 0 when the ignition switch is turned on (but not starting the engine), faulty air flow sensor or engine control unit is suspected.

Hint 3: If the engine can be run idle even though the air flow sensor output frequency is out of specification, troubles are often found in other than the air flow sensor itself.

[Examples]

(1) Disturbed air flow in the air flow sensor
(Disconnected air duct, clogged air cleaner element)

(2) Poor combustion in the cylinder
(Faulty ignition plug, ignition coil, injector, incorrect compression pressure, etc.)

(3) Air leaking into the intake manifold through gap of gasket, etc.

INSPECTION WITH MULTI-USE TESTER (MUT)

Air Flow Sensor

Function	Item No.	Data display	Check condition	Engine condition	Standard value
Data list	12	Sensor air flow (frequency)	• Engine coolant temperature: 80–95°C (176–205°F) Operation of lamps, electric cooling fan, accessories: OFF • Transmission: neutral (For A/T vehicles: P range) • Steering wheel: center position	700 r/min (Idling)	25–50Hz
				2000 r/min	65–105Hz
				Racing	Frequency increases according to engine speed.

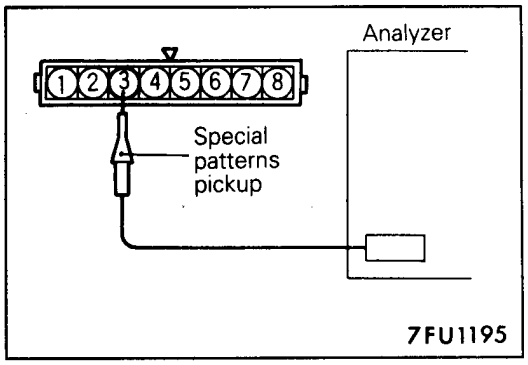
NOTE
A new vehicle [driven approximately 500 km (300 miles) or less], may show the air flow sensor output frequency to be approximately 10% higher than usual.)

AIR FLOW SENSOR RESET SIGNAL

Function	Item No.	Data display	Check condition	Engine condition	Normal display
Data list	34	Reset signal condition	• Engine warm up	700 r/min (Idling)	ON
				200 r/min	OFF

VOLUMETRIC EFFICIENCY

Function	Item No.	Data display	Check condition	Engine condition	Standard value
Data list	37	Volumetric efficiency	• Engine coolant temperature: 80–95ÉC (176–205°F) Operation of lamps, electric cooling fan, accessories: OFF • Transmission: neutral (For A/T vehicles: P range) • Steering wheel: center position	700 r/min (Idling)	15–35%
				2000 r/min	15–30%
				Racing	Volumetric efficiency increases according to engine speed

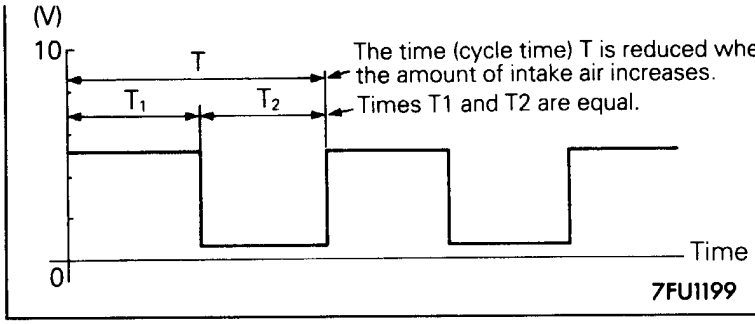


Wave Pattern Inspection Using an Analyzer

Measurement method

(1) Disconnect the air flow sensor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
(2) Connect the analyzer special patterns pickup to terminal ③ of the air flow sensor connector.

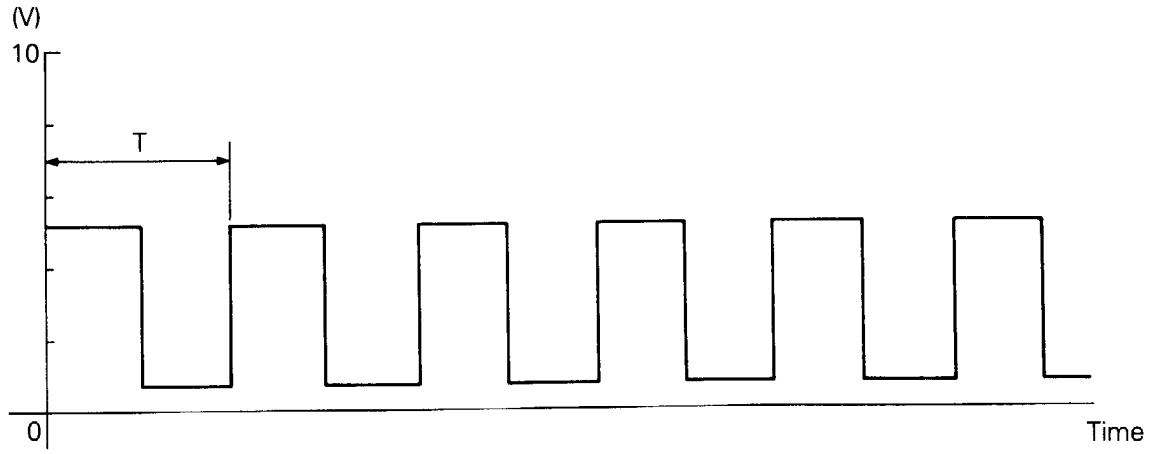
Standard wave pattern



Observation conditions

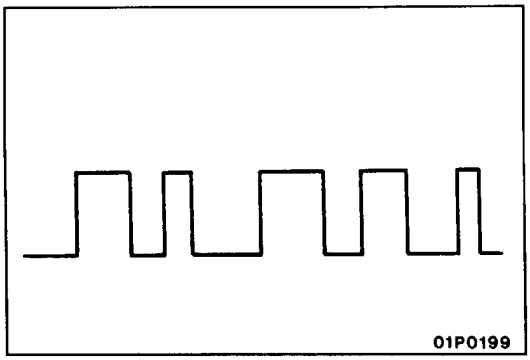
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Idle r/min. (700 r/min.)

Observation conditions (from conditions on above engine speed is increased by racing.)



Wave pattern observation points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.



Examples of abnormal wave patterns

- Example 1

  Cause of problem
  Sensor interface malfunction

  Wave pattern characteristics
  Rectangular wave pattern is output even when the engine is not started.

- Example 2

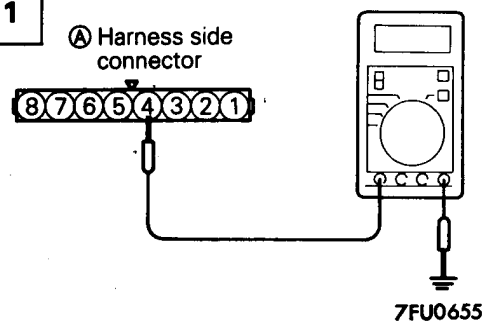
  Cause of problem
  Damaged rectifier or vortex generation column

  Wave pattern characteristics

  Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the air flow sensor is normal.

HARNESS INSPECTION

1



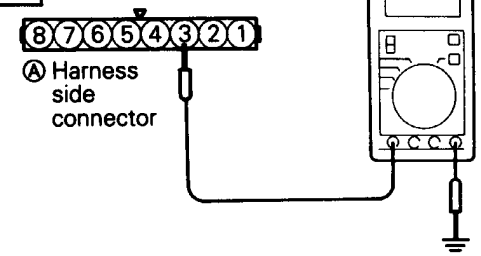
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
5V

OK → 2 Repair the harness. (Ⓐ4 – Control relay) or check the control relay

NG → 2 Repair the harness. (Ⓐ4 – Control relay) or check the control relay

2



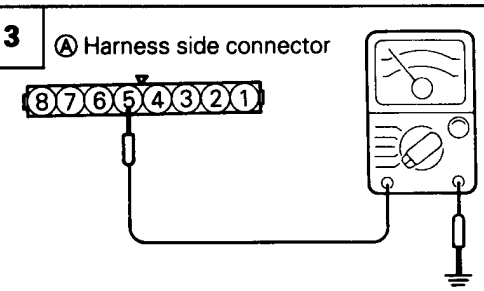
Measure the terminal voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 3

NG → Repair the harness. (Ⓐ3 – 70)

3

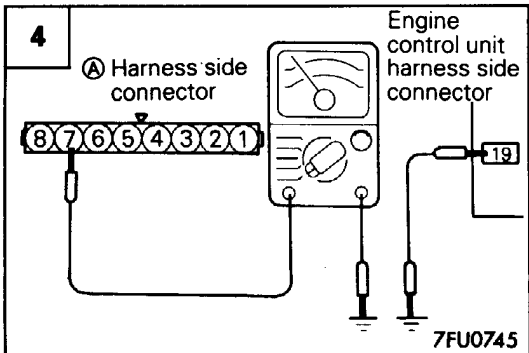


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓐ5 – 72)

4

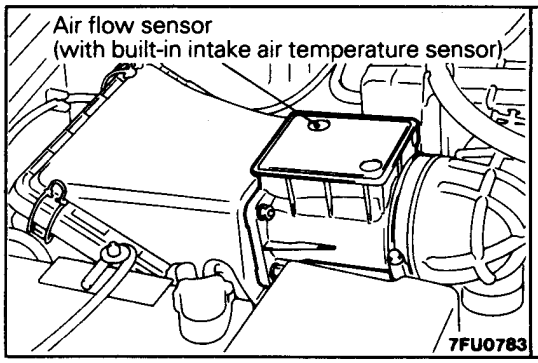


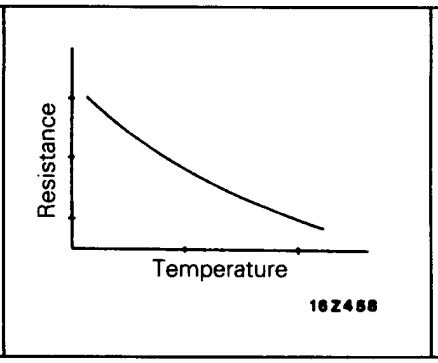
Check for continuity between the air flow sensor and the engine control unit.
- Air flow sensor connector: Disconnected
- Engine control unit connector: Disconnected

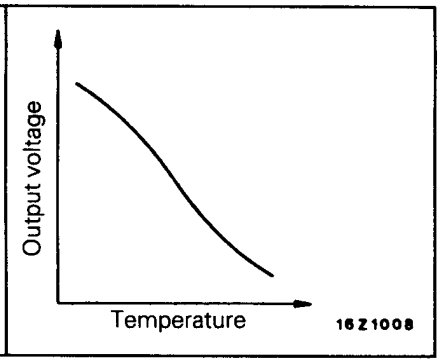
OK → STOP

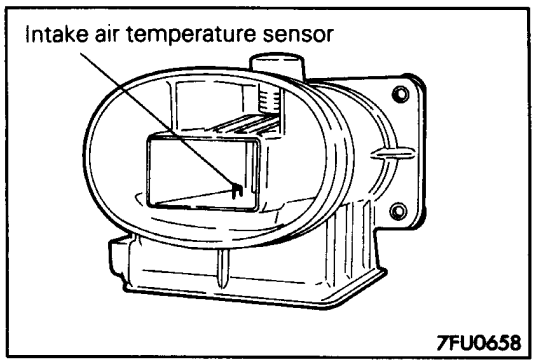
NG → Repair the harness. (Ⓐ7 – 19)

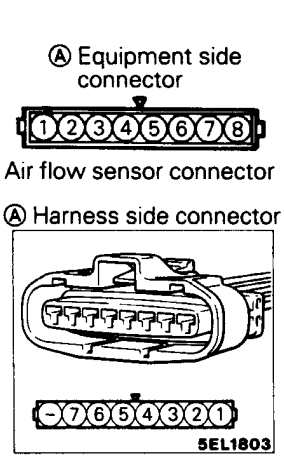
INTAKE AIR TEMPERATURE SENSOR

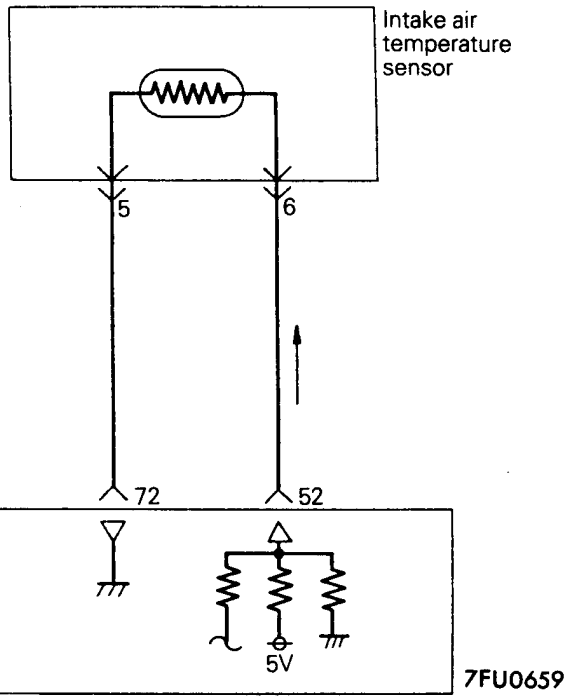












OPERATION

- The intake air temperature sensor converts the engine intake air temperature into a voltage and inputs it to the engine control unit, which then corrects the fuel injection rate, etc. based on the input signal.
- The 5 V power in the engine control unit is supplied via a resistor in the unit to the intake air temperature sensor. Via the sensor which is a kind of resistor, it is earthed in the engine control unit. The intake air temperature sensor resistor has such characteristic that its resistance decreases as the intake air temperature rises.
- The intake air temperature sensor terminal voltage increases or decreases as the sensor resistance increases or decreases. Therefore, the intake air temperature sensor terminal voltage changes with the intake air temperature, decreasing as the temperature rises.

TROUBLESHOOTING HINTS

The intake air temperature sensor senses the intake air temperature in the air cleaner so that it may indicate a temperature different from outside temperature depending on engine operating state.

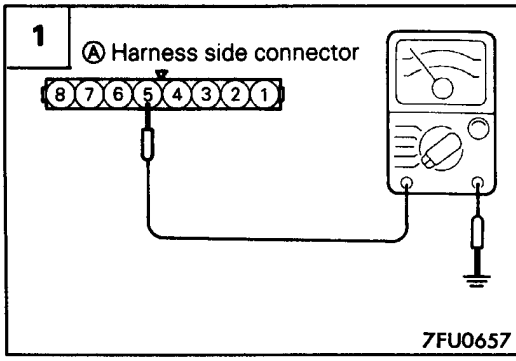
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Intake air temperature	Standard value
Data reading	13	Sensor temperature	Ignition switch: ON or engine running	–20°C (–4°F)	–20°C
				0°C (32°F)	0°C
				20°C (68°F)	20°C
				40°C (104°F)	40°C
				80°C (176°F)	80°C

HARNESS INSPECTION

1

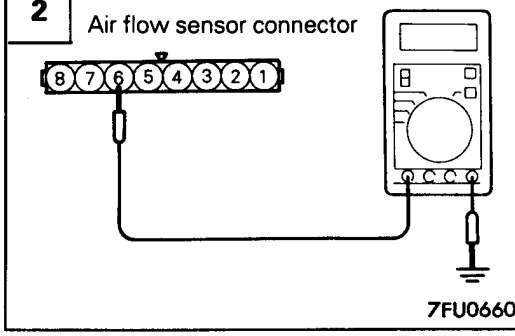


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ5–72)

2

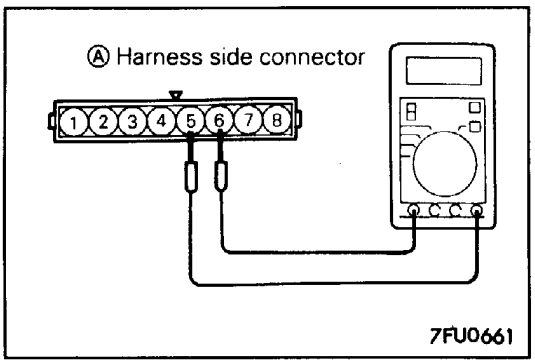


Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5–4.9

OK → STOP

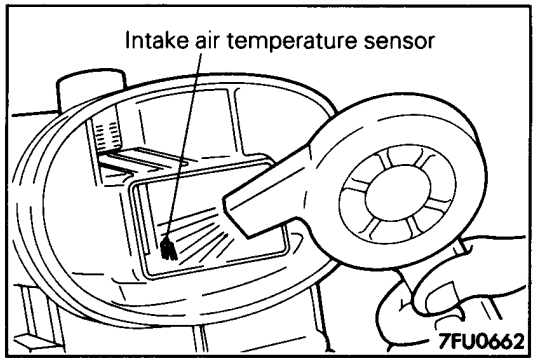
NO → Repair the harness. (Ⓐ6–52)



SENSOR INSPECTION

(1) Disconnect the air flow sensor connectors.
(2) Measure resistance between terminals ⑤ and ⑥.

Temperature [°C (°F)]	Resistance (kΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4

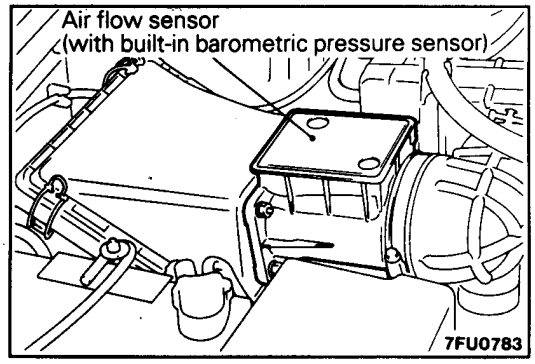


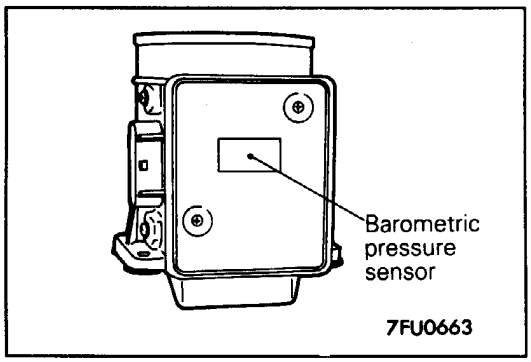
(3) Measure resistance while heating the sensor using a hair drier.

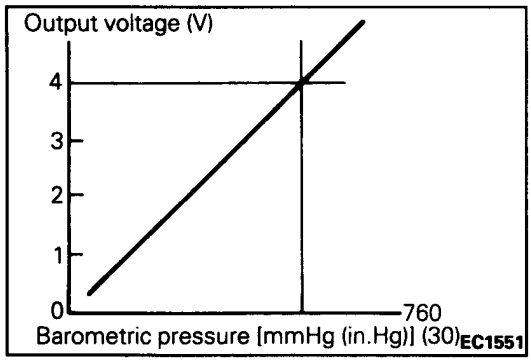
Temperature [°C (°F)]	Resistance (kΩ)
Higher	Smaller

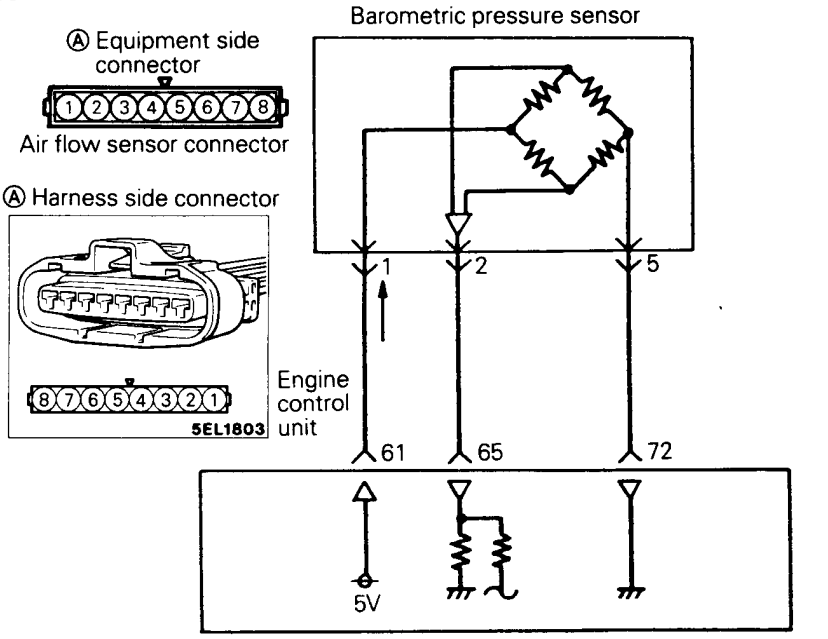
(4) If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.

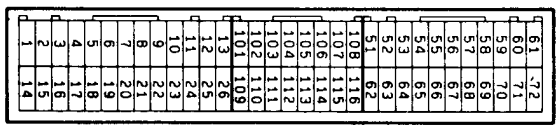
BAROMETRIC PRESSURE SENSOR











OPERATION

- The barometric pressure sensor converts the barometric pressure into a voltage and inputs it to the engine control unit, which then corrects the fuel injection rate, etc. based on the input signal.
- The 5 V power in the engine control unit is supplied to the barometric pressure sensor. Through the circuit in the sensor, it is earthed in the engine control unit.
- The barometric pressure sensor output voltage which is proportional to the barometric pressure (absolute pressure) is supplied to the engine control unit.

TROUBLESHOOTING HINTS

Hint 1: If the barometric pressure sensor is faulty, poor driveability is caused at high altitude, in particular.

Hint 2: If the pressure indication of the barometric pressure sensor drops significantly during high speed driving, check the air cleaner for clogging.

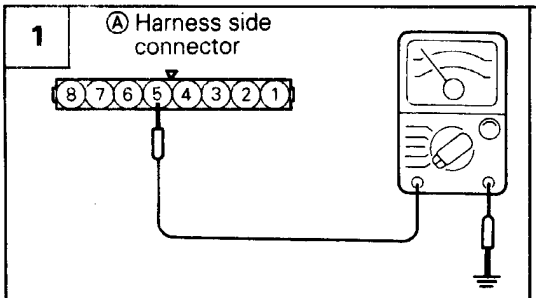
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Altitude	Standard value
Data reading	25	Sensor pressure	Ignition switch: ON	0 m (0 ft.)	760 mmHg
				600 m (1,969 ft.)	710 mmHg
				1,200 m (3,937 ft.)	660 mmHg
				1,800 m (5,906 ft.)	610 mmHg

HARNESS INSPECTION

1

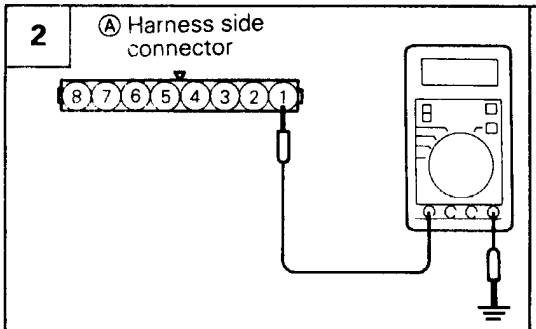


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ5–72)

2



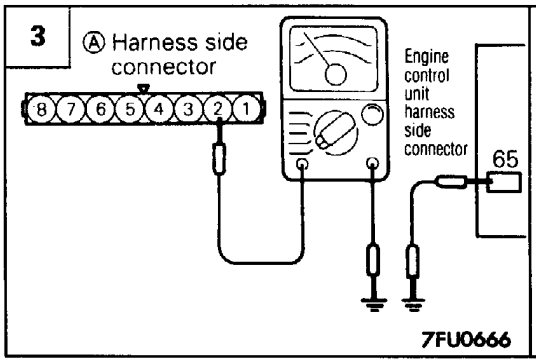
Measure the power supply voltage of the barometric pressure sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 3

NG → Repair the harness. (Ⓐ1–61)

3

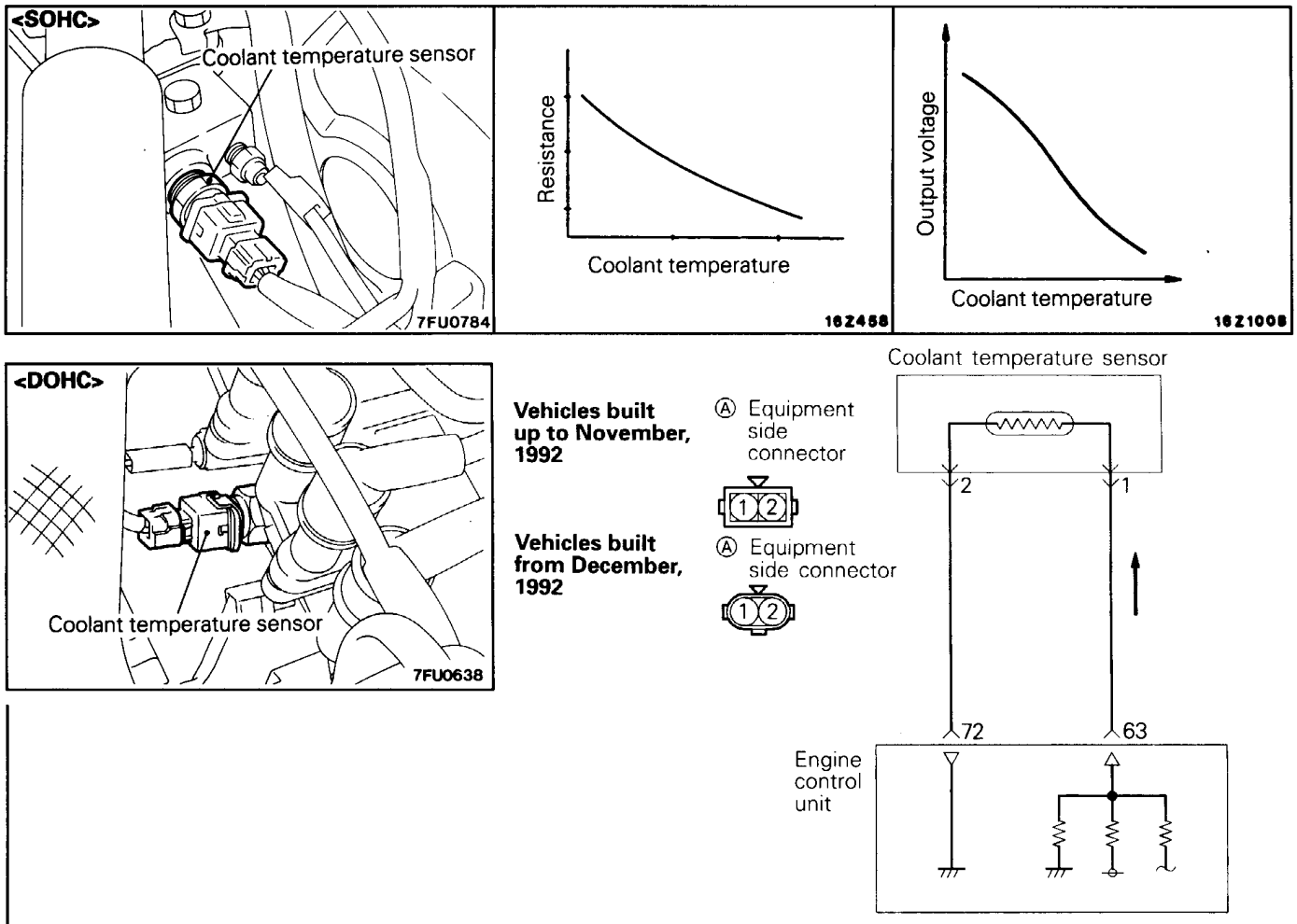


Check for an open-circuit, or a short-circuit to earth between the engine control unit and the barometric pressure sensor.
- Air flow sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ2–65)

ENGINE COOLANT TEMPERATURE SENSOR



OPERATIONS

- The coolant temperature sensor converts the engine coolant temperature into a voltage and inputs it to the engine control unit, which then controls the fuel injection rate and fast idle speed when the engine is cold based on the input signal.
- The 5 V power in the engine control unit is supplied via a resistor in the unit to the coolant temperature sensor. Through the sensor which is a kind of resistor, it is earthed in the engine control unit. The coolant temperature sensor resistor has such characteristic that its resistance decreases as the coolant temperature rises.
- The coolant temperature sensor terminal voltage increases or decreases as the sensor resistance increases or decreases. Therefore, the coolant temperature sensor terminal voltage changes with the coolant temperature, decreasing as the temperature rises.

TROUBLESHOOTING HINTS

If the fast idle speed is inadequate or the engine emits dark smoke during engine warm up operation, the coolant temperature sensor is often faulty.

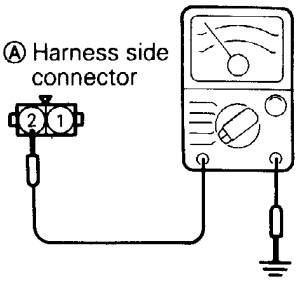
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	21	Sensor temperature	Ignition switch: ON or engine operating	–20°C (–4°F)	–20°C
				0°C (32°F)	0°C
				20°C (68°F)	20°C
				40°C (104°F)	40°C
				80°C (176°F)	80°C

HARNESS INSPECTION

1



7FU0668

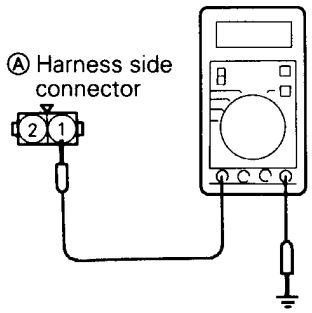
Check for continuity of the earth circuit.

- Connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ2–72)

2



7FU0669

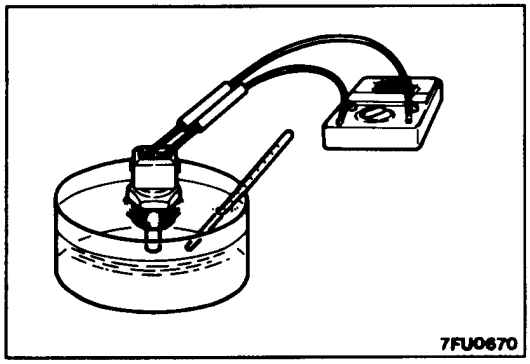
Measure the power supply voltage.

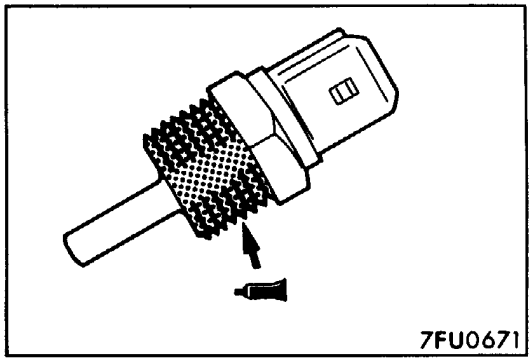
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5–4.9

OK → STOP

NG → Repair the harness. (Ⓐ1–63)





SENSOR INSPECTION

(1) Remove the engine coolant temperature sensor.
(2) Measure the resistance value of the engine coolant temperature sensor while immersing the sensor section into warm water.

Standard value

Temperature (°C)	Resistance value (kΩ)
0	5.8
20	2.4
40	1.1
80	0.3

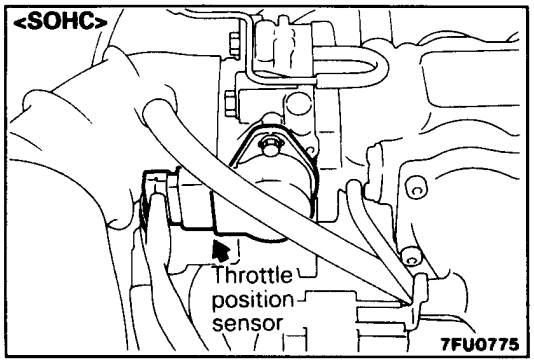
(3) If outside the standard value, replace the engine coolant temperature sensor.

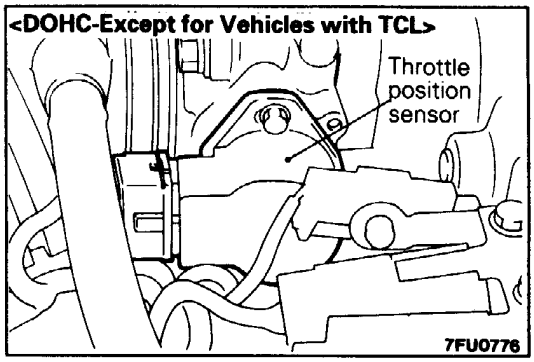
NOTE
Apply sealant to the thread section and tighten to the specified torque.

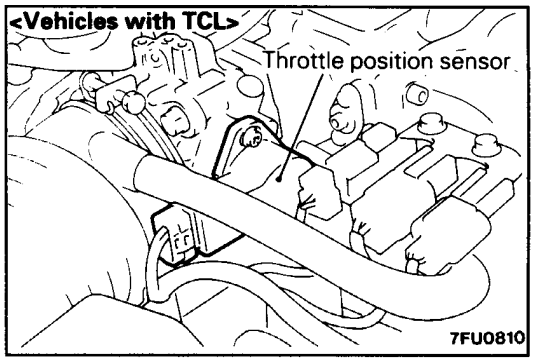
Sealant: 3M Nut Locking Part No. 4171 or equivalent to threaded portion

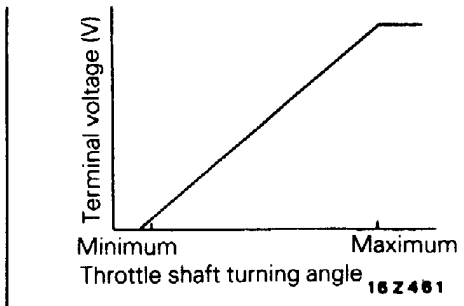
Tightening torque: 30 Nm (3 kgm, 22 ft.lbs.)

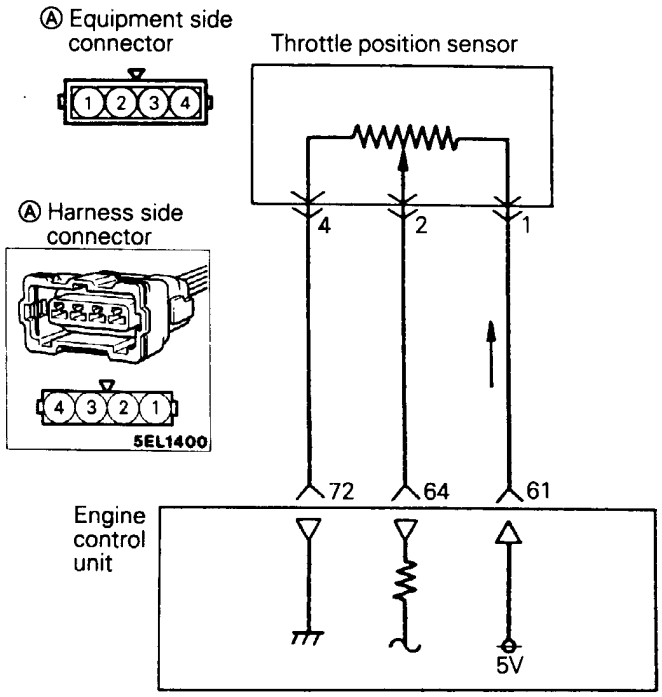
THROTTLE POSITION SENSOR



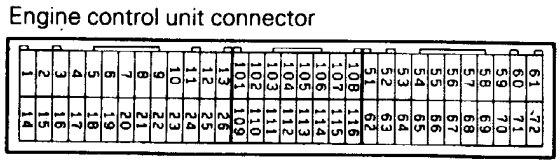








7FU0672



7FU0653

OPERATION

- The throttle position sensor converts the throttle position opening into a voltage and inputs it to the engine control unit, which then controls the fuel injection based on the input signal.
- The 5 V power in the engine control unit is supplied to the throttle position sensor. Through the resistor in the sensor, it is earthed in the engine control unit.
- As the throttle valve shaft rotates from the idle position to wide open position, the resistance between the variable resistor terminal of the throttle position sensor and the earth terminal increases. As a result, the voltage at the throttle position sensor variable resistance terminal also increases.

TROUBLESHOOTING HINTS

Hint 1: The throttle position sensor signal is more important in the control of automatic transmission than in the engine control. Shifting shock and other troubles will be caused if this sensor is faulty.

Hint 2: If the output voltage of the throttle position sensor is out of specification, adjust the sensor and check the voltage again. If there is an evidence of disturbed fixed SAS setting adjust the fixed SAS.

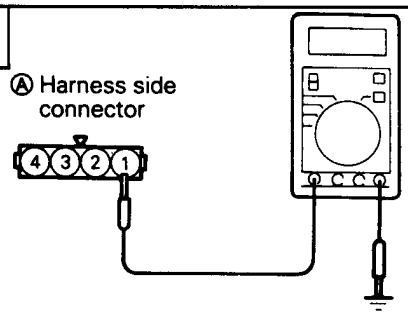
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Throttle valve	Standard value
Data reading	14	Sensor voltage	Ignition switch: ON	At idle position	300–1000 mV
				Open slowly	Increases with valve opening
				Open widely	4,500–5,500 mV

HARNESS INSPECTION

1



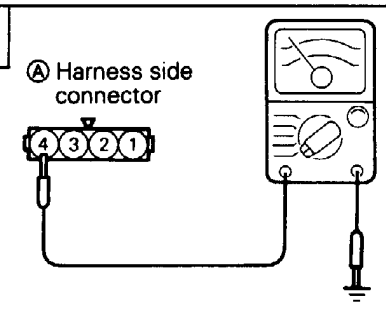
Measure the power supply voltage of the throttle position sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness. (Ⓐ1–61)

2

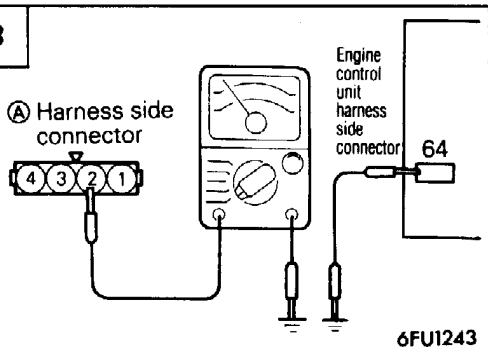


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ4–72)

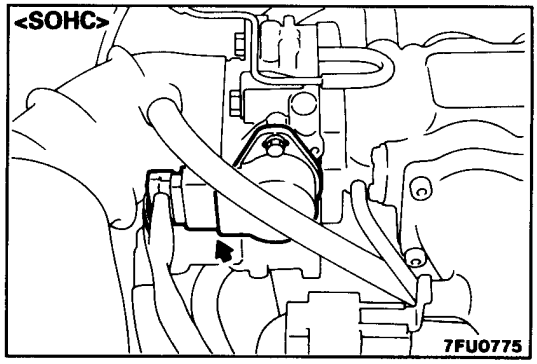
3

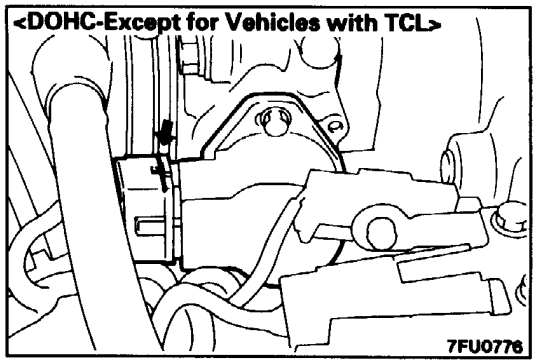


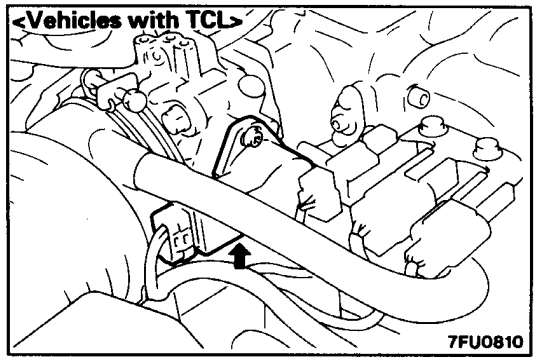
Check for an open-circuit, or a short-circuit to earth between the engine control unit and the throttle position sensor.
- Throttle position sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ2–64)

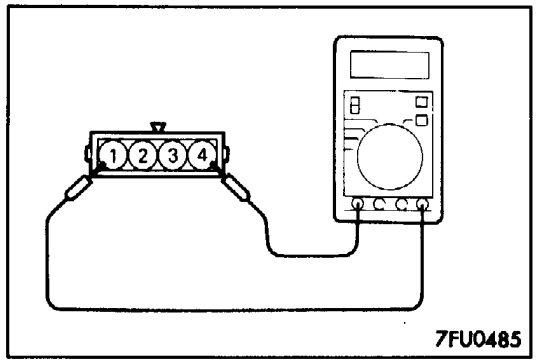






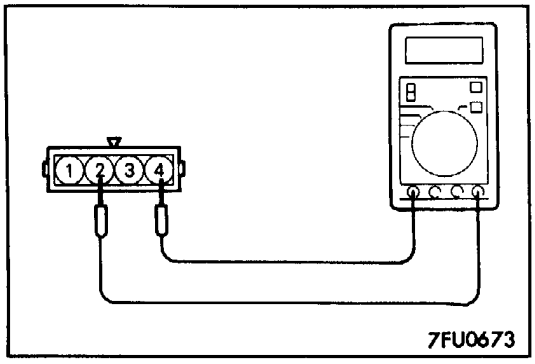
SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector.



(2) Measure the resistance between the terminal ① and the terminal ④ on the side of the throttle position sensor connector.

Standard value: 3.5–6.5 kΩ



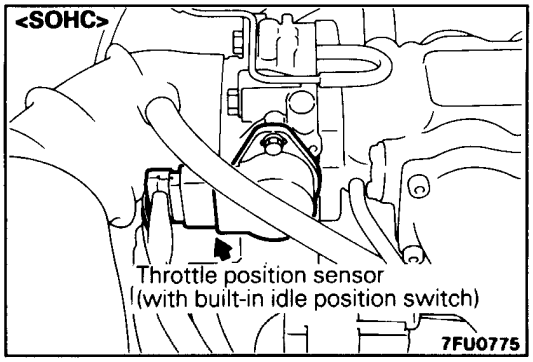
(3) Measure the resistance between the terminal ② and the terminal ④ on the side of the throttle position sensor connector.

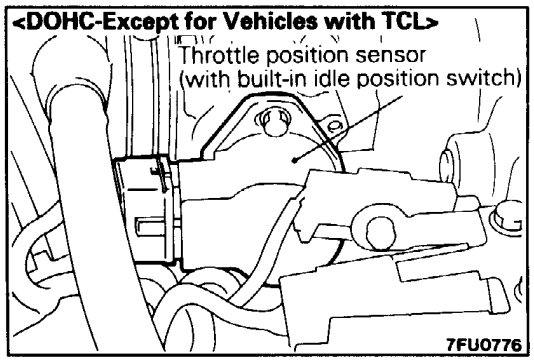
Slowly open the throttle valve from the idle position to full open.	It varies smoothly in proportion to the opening of throttle valve.

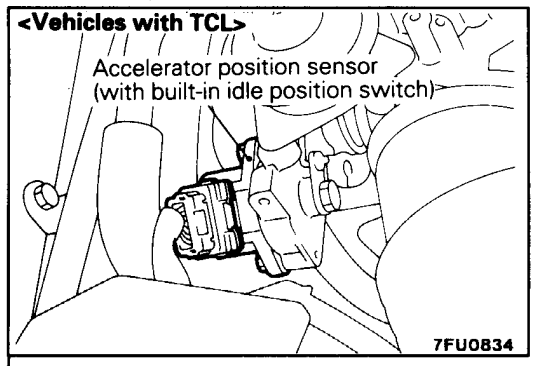
(4) If there is any deviation from the standard value, or if it does not vary smoothly, replace throttle position sensor.

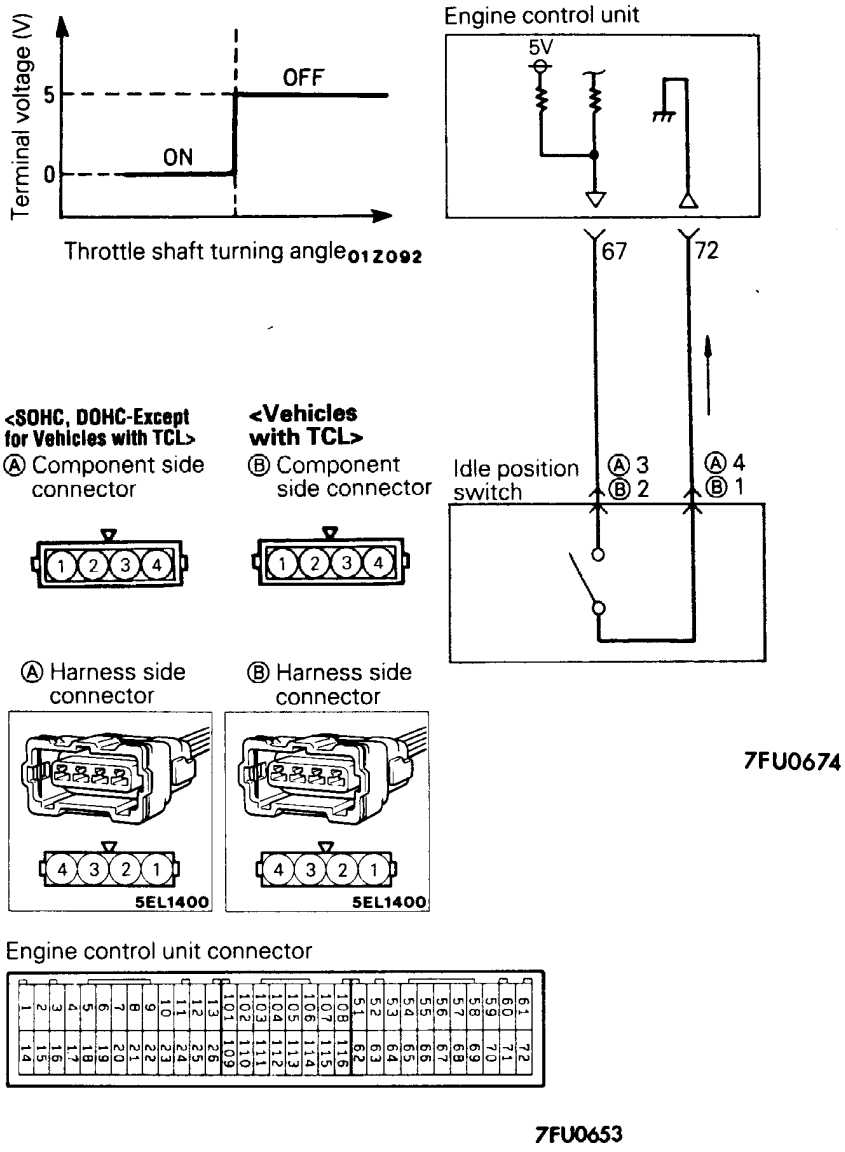
NOTE
Refer to page 13-43 for an explanation for adjusting the throttle position sensor.

IDLE POSITION SWITCH









OPERATION

- The idle position switch senses whether the accelerator pedal is depressed or not, converts it into high/low voltage and inputs the voltage to the engine control unit, which then controls the idle speed control servo based on the input signal.
- The battery voltage in the engine control unit is applied to the idle position switch through a resistor. When the accelerator pedal is released, the idle position switch is turned on to conduct the voltage to earth. This causes the idle position switch terminal voltage to go low from high.

TROUBLESHOOTING HINTS

If the idle position switch harness and individual part check results are normal but the idle position switch output is abnormal, the following troubles are suspected.

(1) Improper adjusted accelerator cable
(2) Improper adjustment of the fixed SAS

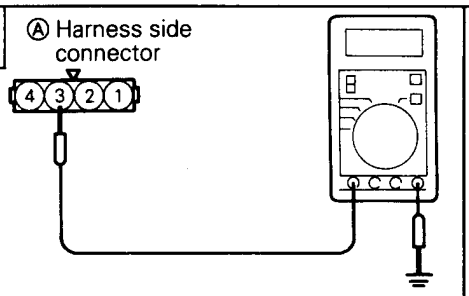
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Throttle valve	Normal indication
Data reading	26	Switch state	Ignition switch: ON (check by operating accelerator pedal repeatedly)	At idle position	ON
				Open a little	OFF

HARNESS INSPECTION

1



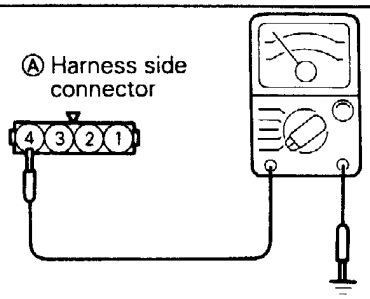
Measure the power supply voltage of the idle position switch.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4 or more

OK → 2

NO → Repair the harness. (Ⓐ3–67)

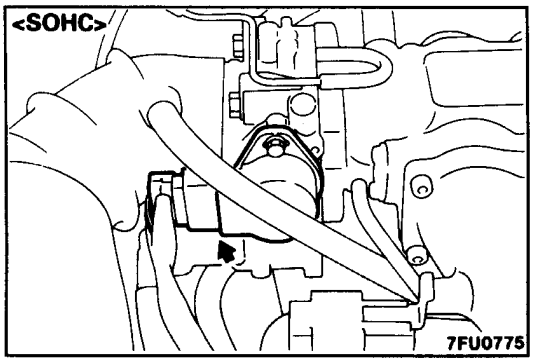
2

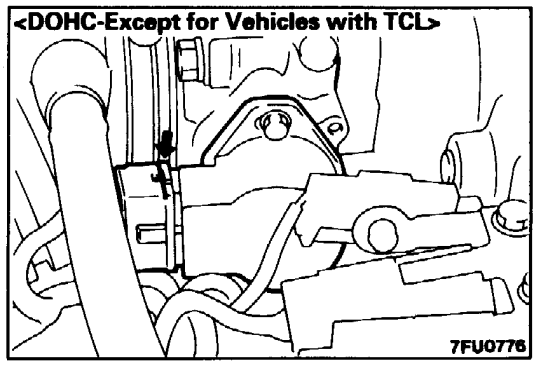


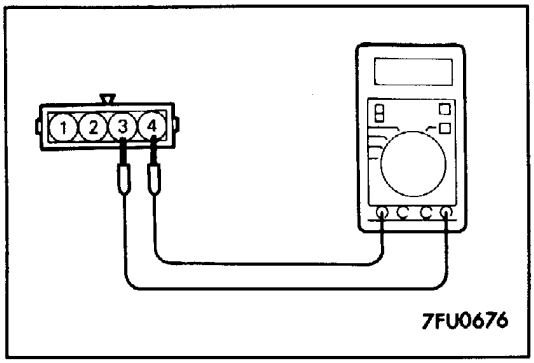
Check continuity of the earth circuit.
- Connector: Disconnect

OK → STOP

NO → Repair the harness. (Ⓐ4–72)







SENSOR INSPECTION
<SOHC, DOHC-Except for Vehicles with TCL>

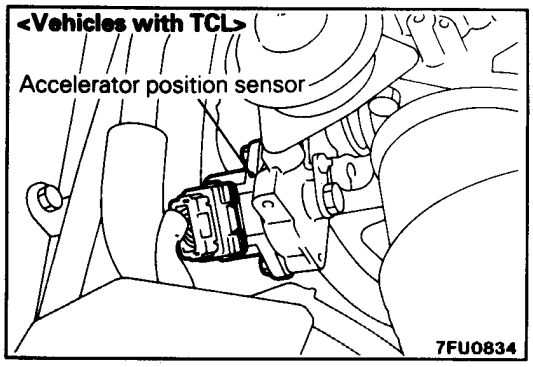
(1) Disconnect the throttle position sensor connector.

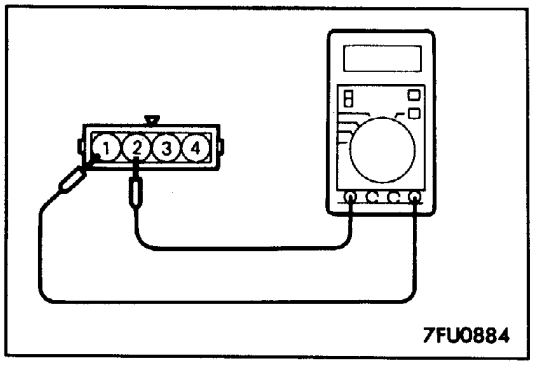
(2) Check the continuity between terminal ③ and ④.

Accelerator pedal	Continuity
Depressed	Non-conductive (∞Ω)
Released	Conductive (0Ω)

(3) If out of specification, replace the throttle position sensor assembly.

NOTE
Adjust the idle position switch and throttle position sensor after replacement. (Refer to page 13-43.)





SENSOR INSPECTION <Vehicles with TCL>

(1) Disconnect the accelerator position sensor connector

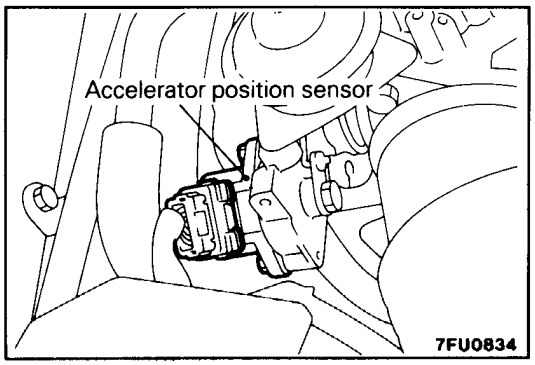
(2) Check continuity between the terminal ① and the terminal ② on the side of the accelerator position sensor connector.

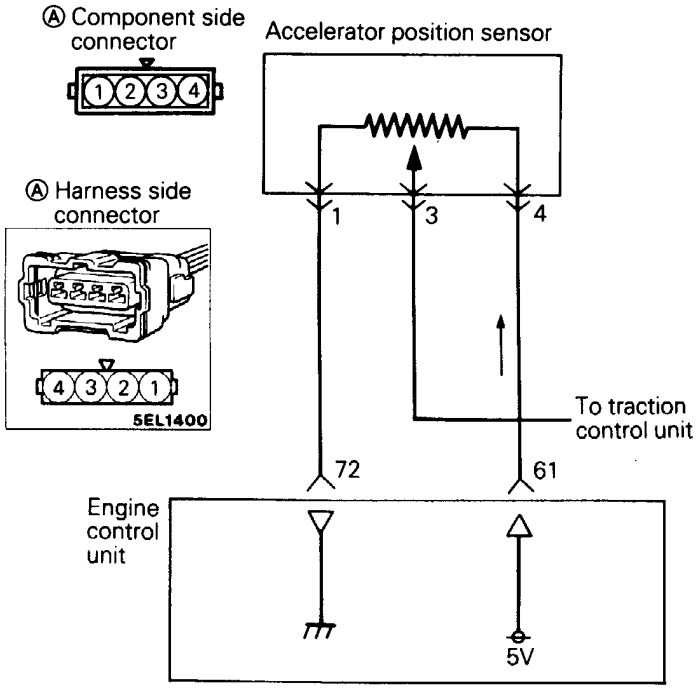
Accelerator pedal	Continuity
Depressed	Non-continuity
Released	Continuity

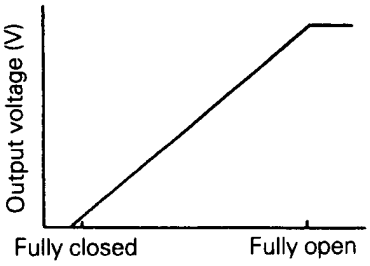
(3) Replace the throttle position sensor, if it is defective.

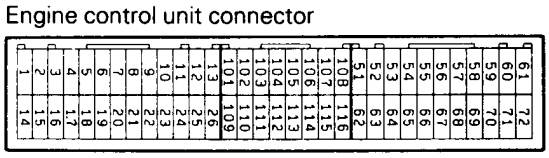
NOTE
Adjust the idle position switch and accelerator position sensor after replacement. (Refer to page 13-45.)

ACCELERATOR POSITION SENSOR (APS) <Vehicles with TCL>









OPERATION

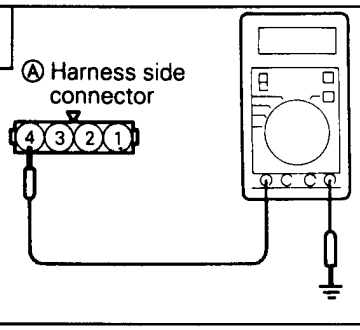
- The accelerator position sensor converts the amount the accelerator pedal is depressed into a voltage and inputs this to the traction control unit. The traction control unit uses this signal for traction control.
- 5 volts from the engine control unit is supplied to one end of the resistor in the accelerator position sensor, and the other end (earth terminal) is earthed at the engine control unit.
- When the accelerator pedal is depressed, resistance between the accelerator position sensor output terminal (variable resistance terminal) and the earth terminal increases according to the amount the pedal is depressed. As a result, the accelerator position sensor output voltage also increases as to the accelerator pedal being pressed.

TROUBLESHOOTING HINT

If accelerator position sensor output voltage deviates from the standard value, adjust the accelerator position sensor first, and then recheck.

HARNESS INSPECTION

1



Measure supplied voltage.

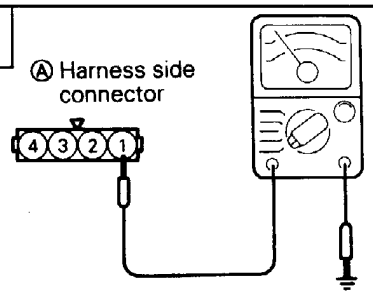
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

NG → Repair the harness (Ⓐ4 – 61)

2

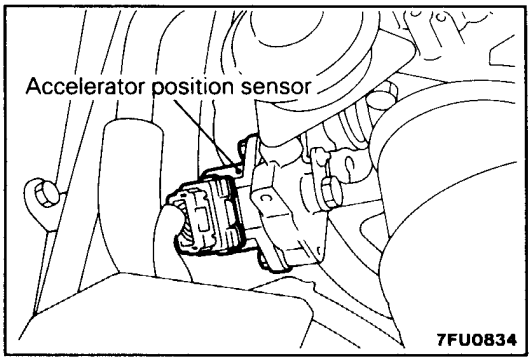


Check continuity of the earth circuit.

- Connector: Disconnect

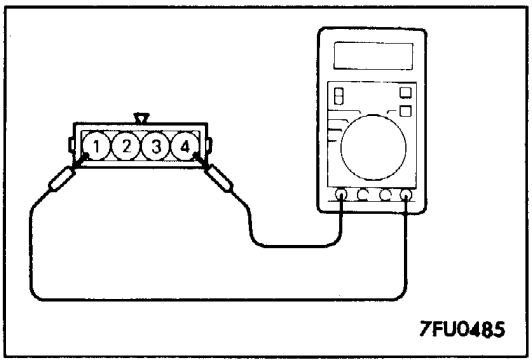
OK → 3

NG → Repair the harness (Ⓐ1 – 72)

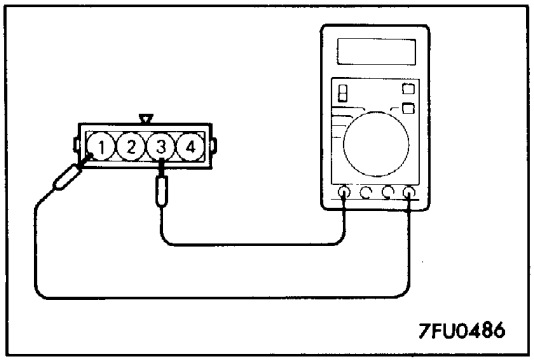


SENSOR INSPECTION

(1) Disconnect the accelerator position sensor connector.



(2) Measure the resistance of the connector terminal ① and the terminal ④ on the accelerator position sensor side.
Standard value: 3.5–6.5 kΩ



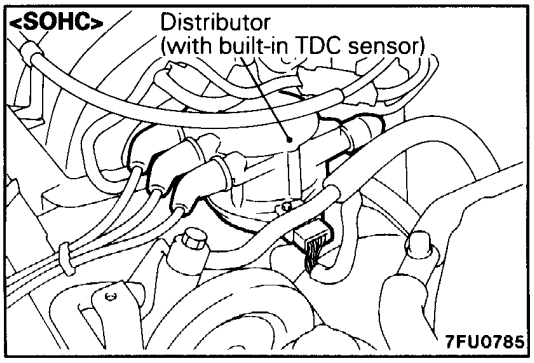
(3) Measure the resistance between the connector terminal ① and terminal ③ on the accelerator position sensor side.

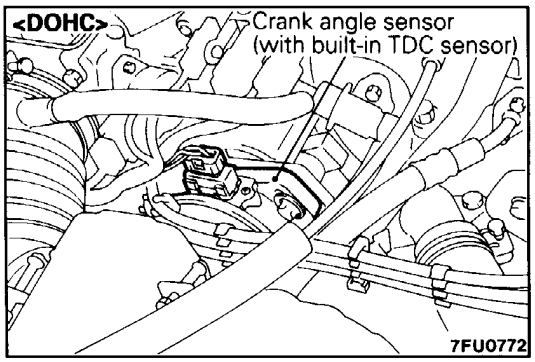
Slowly open the throttle valve from the idle position to full open.	It varies smoothly in proportion to throttle valve opening.

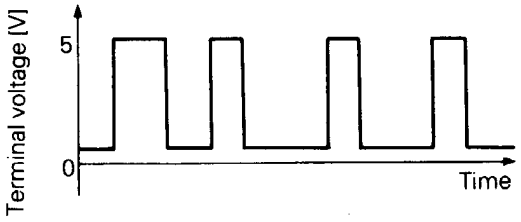
(4) If it deviates from the standard value, or if it does not vary smoothly, replace the accelerator position sensor.

NOTE
Refer to page 13-45 for an explanation for adjusting the throttle positions sensor.

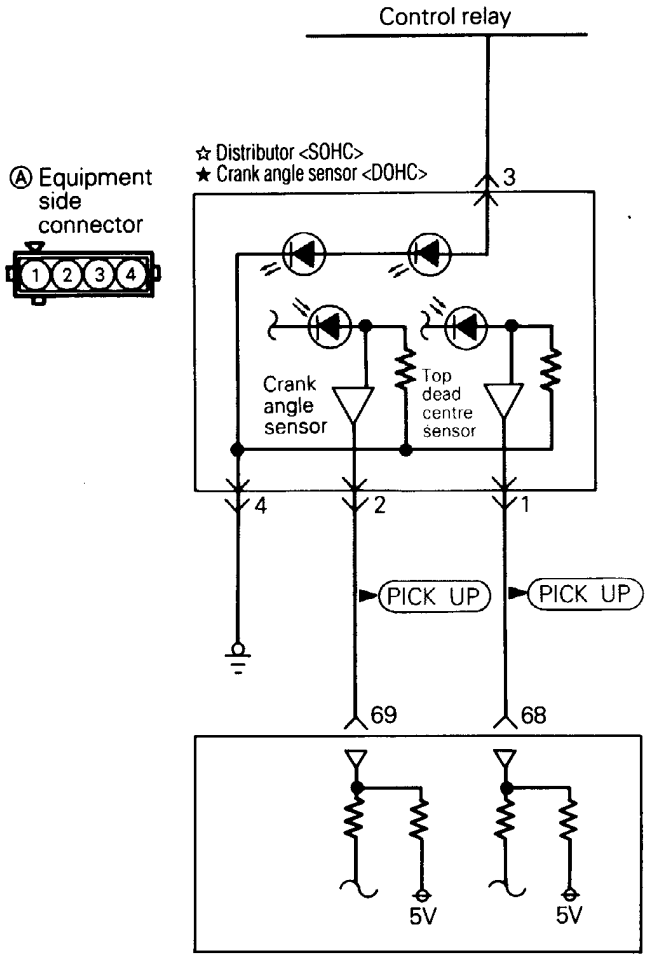
TOP DEAD CENTRE SENSOR
<SOHC, DOHC-Vehicles built up to November, 1992>







7FU0677



7FU0873

OPERATION

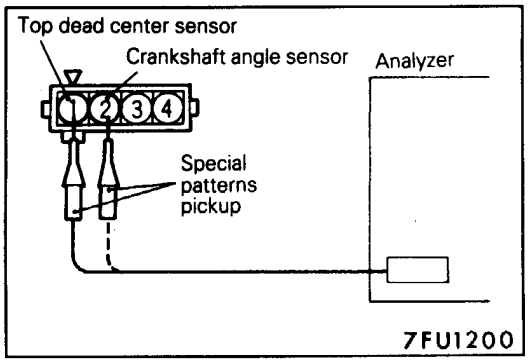
- The top dead centre sensor detects the top dead center of pistons No. 1, No. 3 and No. 5, converts this into a pulse signal which is input to the engine contorl unit. Based on this signal, the engine control unit calculates the fuel injection order, etc.
- The top dead centre sensor is supplied with power from the control relay and is earthed to the vehicle body. 5 volts is supplied to the top dead centre sensor output teminal from the engine control unit, and a pulse signal is generated by opening and closing the line between the top dead centre sensor output terminal and earth.

TROUBLESHOOTING HINT

Hint 1: A defective to pdead centre sensor would result in inappropriate sequential ignition, which causes engine stalls, unstable idling, and poor acceleration.

Hint 2: with the ignition switch ON (engine not started), the top dead centre sensor or engine control unit can be assumed to be malfunctioning if the top dead centre sensor signal is output.

Wave Pattern Inspection Using an Analyzer



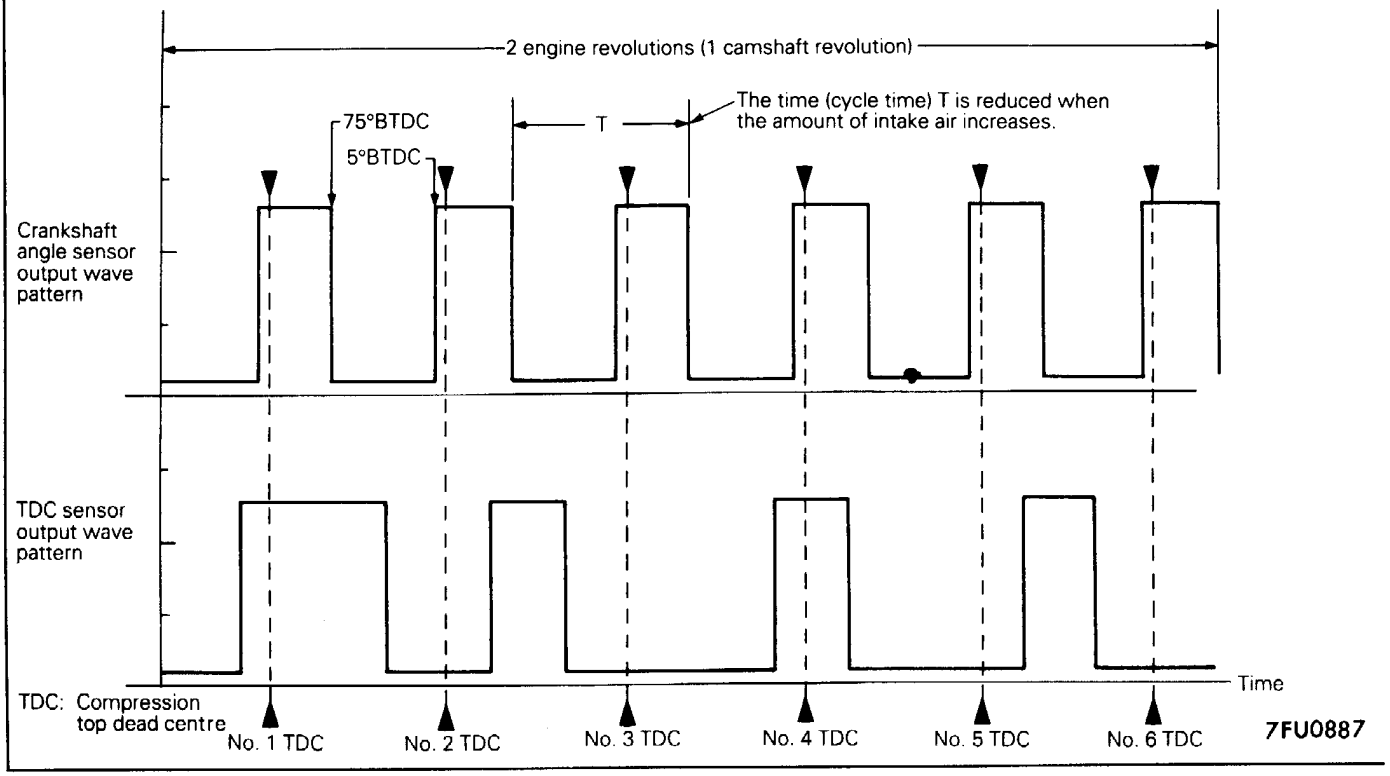
Measurement method

(1) Disconnect the crankshaft angle sensor connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
(2) Connect the analyzer special patterns pickup to terminal ① of the crankshaft angle sensor connector. (When inspecting the top dead centre sensor signal wave pattern.)
(3) Connect the analyzer special patterns pickup to terminal ② of the crankshaft angle sensor connector. (When inspecting the crankshaft angle sensor signal wave pattern.)

Standard wave pattern

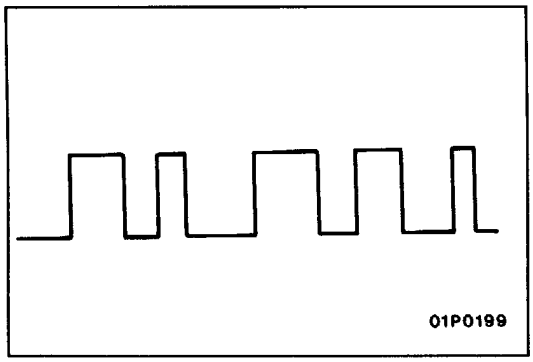
Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Idle r/min. (700 r/min.)



Wave pattern observation points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

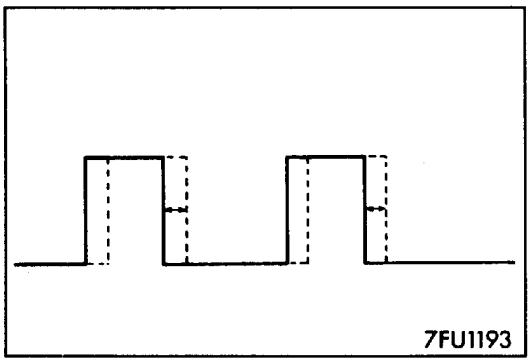


Examples of abnormal wave patterns

- Example 1

  Cause of problem
  Sensor interface malfunction

  Wave pattern characteristics
  Short wave pattern is output even when the engine is not started.



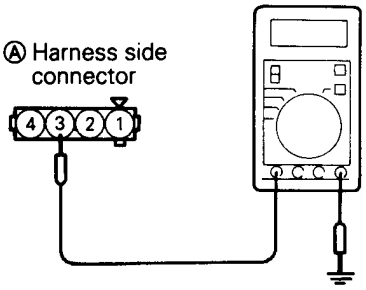
- Example 2

  Cause of problem
  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics
  Wave pattern is displaced to the left or right.

HARNESS INSPECTION

1



Measure the power supply voltage.

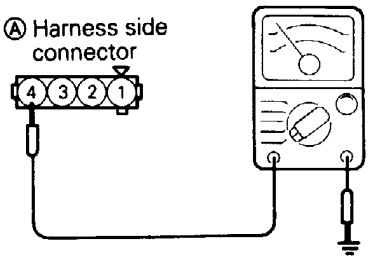
- Sensor connector: Disconnected
- Ignition switch: ON

Voltage (V)
5V

OK → 2

OK → Repair the harness. (Ⓐ3–Engine control relay)

2



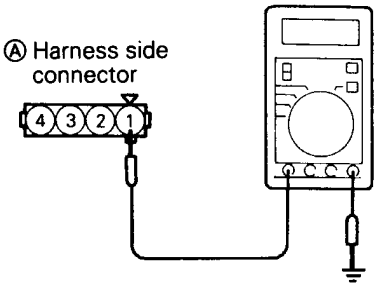
Check for continuity of the earth circuit.

- Connector: Disconnected

OK → 3

OK → Repair the harness. (Ⓐ4–Earth)

3



Check the output circuit voltage.

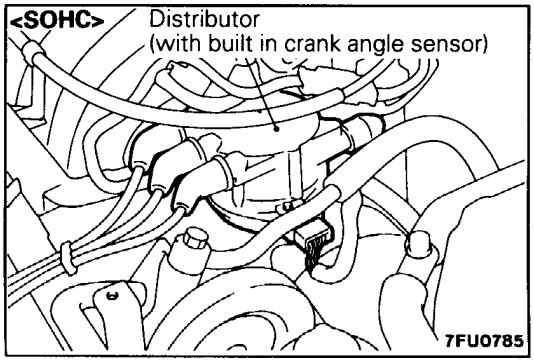
- Connector: Disconnected
- Ignition switch: ON

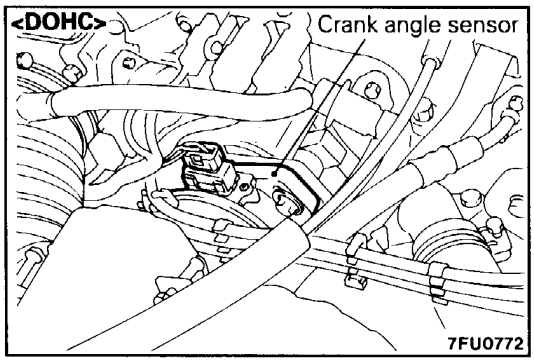
Voltage (V)
4.8–5.2

OK → STOP

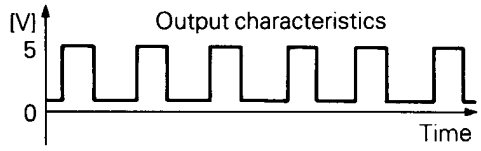
OK → Repair the harnes. (Ⓐ1–68)

CRANK ANGLE SENSOR
<SOHC, DOHC-Vehicles built up to November, 1992>





NOTE
Arrow ◆ indicates oscilloscope measurement point.



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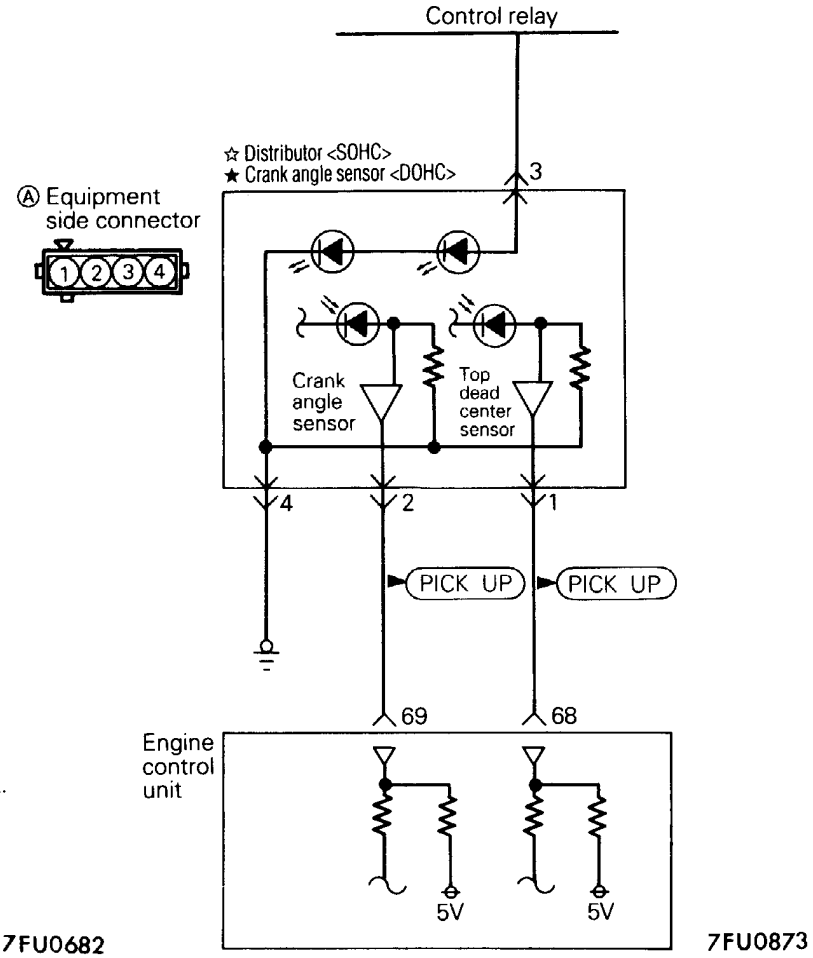


OPERATION

- The crank angle sensor detects the crank angle (position), converts this to a pulse signal and inputs it to the engine control unit.
- The engine control unit not only calculates the engine speed based on this signal but also controls fuel injection timing and ignition timing.
- The crank angle sensor is supplied with power from the control relay and is earthed to the vehicle body. 5 volts is supplied to the crank angle sensor output terminal from the engine control unit, and the pulse signal is generated by opening and closing the line between the output terminal of the crank angle sensor and earth.

TROUBLESHOOTING HINTS

Hint 1: If sudden shocks are felt during driving or if the engine stalls unexpectedly when it is idling, try shaking the crank angle sensor harness while the engine is idling. If the engine stalls, it can be assumed that the connection of the crank angle sensor connector is defective.

Hint 2: When the crank angle sensor outputs a pulse signal with the ignition switch ON (engine not started), it can be assumed that the crank angle sensor or engine control unit is defective.

Hint 3: When the engine does not start, and if the crank angle sensor output speed is 0 r/min. when cranking, it can be assumed that the crank angle sensor is defective or the timing belt is broken.

Hint 4: When the engine does not start, if the tachometer pointer indicates 0 r/min. when cranking, the ignition coil primary current is not interrupted so it can be assumed that the ignition system circuit and ignition coil, and power transistor are defective.

Hint 5: If idling is possible even if the r/min. displayed by the crank angle sensor deviates from the standard value, usually the cause of the defect is something other than the crank angle sensor.

Example of defect

(1) Defective engine coolant temperature sensor
(2) Defective idle speed control servo
(3) Poor adjustment of standard idling speed.

INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Check content	Normal state
Data reading	22	Cranking speed	• Engine cranking • Tachometer connected (check on and off of primary current of ignition coil by tachometer)	Compare cranking speed and multi-use tester reading	Indicated speed to agree

NOTE (DOHC engine only)
The tachometer indicates 1/3 of actual engine speed. Consequently, three times the indication on the tachometer is the actual engine speed. If inspected when a tachometer is set in the range of two cylinders, the tachometer shows the actual engine speed.

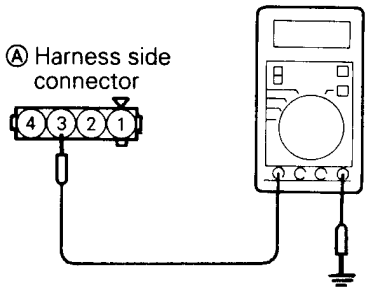
Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	22	Idle speed	• Engine: Running at idle • Idle position switch: ON	–20°C (–4°F)	1500–1700 <SOHC> 1300–1500 <DOHC>
				0°C (32°F)	1250–1450
				20°C (68°F)	1050–1250 <SOHC> 1100–1300 <DOHC>
				40°C (104°F)	850–1050 <SOHC> 950–1150 <DOHC>
				80°C (176°F)	600–800

Wave Pattern Inspection Using an Analyzer

Refer to the top dead centre sensor section (P.13-90-1)

HARNESS INSPECTION

1



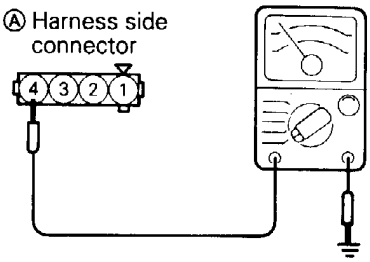
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
5V

OK → 2

NG → Repair the harness. (Ⓐ3 – Control relay)

2

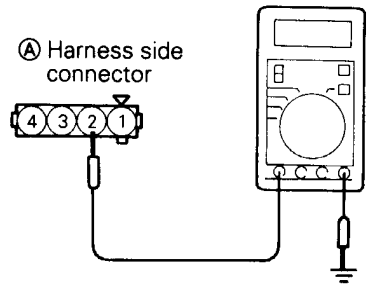


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ4 – Earth)

3



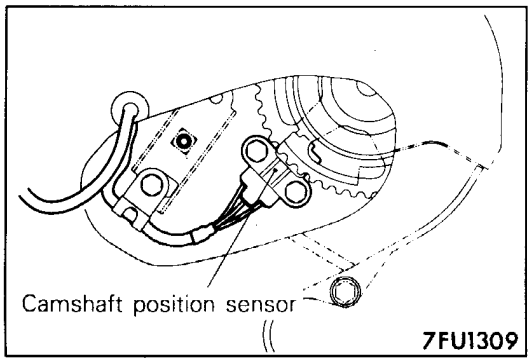
Check the voltage of the output circuit.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

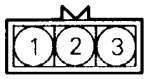
OK → STOP

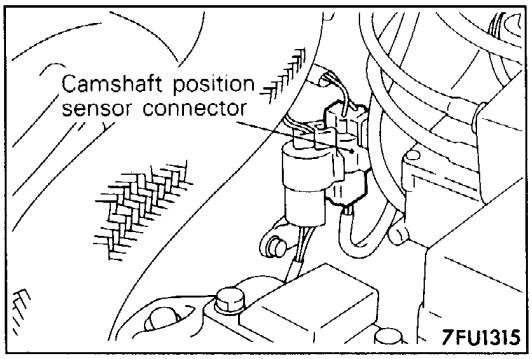
NG → Repair the harness. (Ⓐ2 – 69)

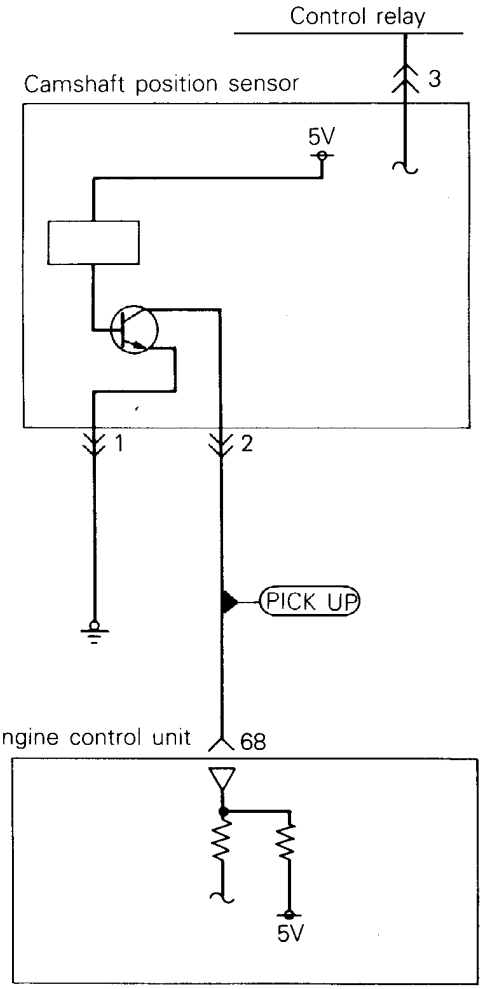
CAMSHAFT POSITION SENSOR <DOHC-Vehicles built from December, 1992>

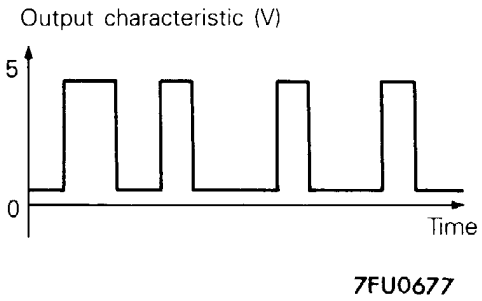


Ⓐ Equipment side connector

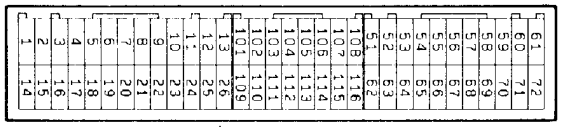








Engine control unit connector



7FU0653

OPERATION

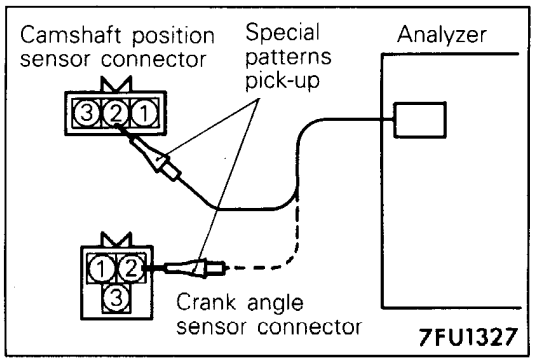
- The camshaft position sensor detects the top dead centre on the compression stroke, converts it into a pulse signal and inputs it to the engine control unit. The engine control unit determines the fuel injection sequence based on this signal.
- Power to the camshaft position sensor is supplied from the control relay, and the earth is located in the body. A 5V voltage is applied from the engine control unit to the camshaft position sensor output terminal, and the camshaft position sensor generates a pulse signal as it switches from OPEN to SHORT (power transistor inside the sensor switches ON/OFF) between the output terminal and the earth.

TROUBLESHOOTING HINTS

Hint 1: If the camshaft position sensor is defective, proper sequential injection will not occur, so the engine will stall, or unstable idling and poor acceleration will occur.

Hint 2: When the camshaft position sensor outputs a pulse signal when the ignition switch is turned to ON (without starting the engine), the camshaft position sensor or engine control unit is probably defective.

Wave Pattern Inspection Using an Analyzer



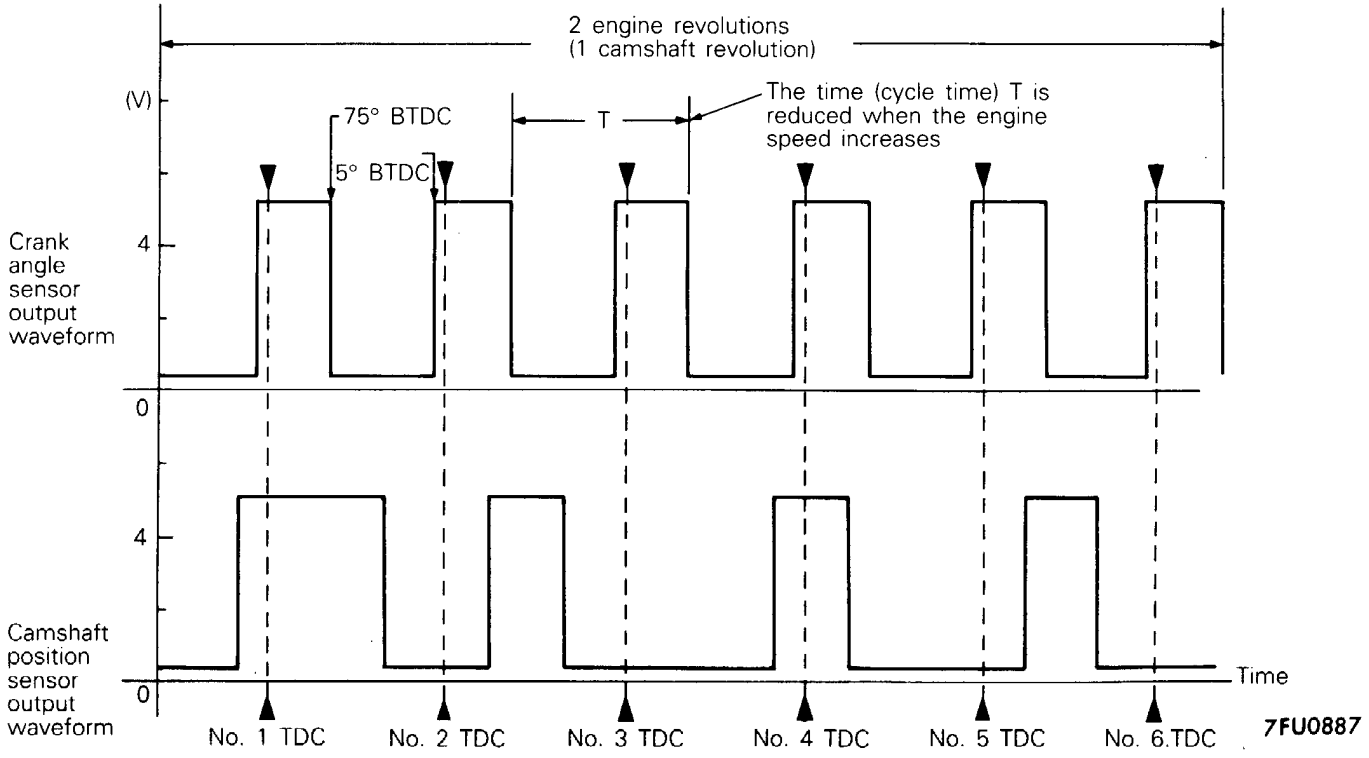
Measurement method

(1) Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991223) and jumper wire in between. (All terminals should be connected.)
(2) Connect the analyzer special patterns pickup to camshaft position sensor terminal ②.
(3) Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
(4) Connect the analyzer special patterns pickup to crank angle sensor terminal ②.

Standard wave

Observation conditions

Function	Special patterns
Pattern height	Low
Patterns selector	Display
Engine speed	Idle speed



TDC: Top dead centre

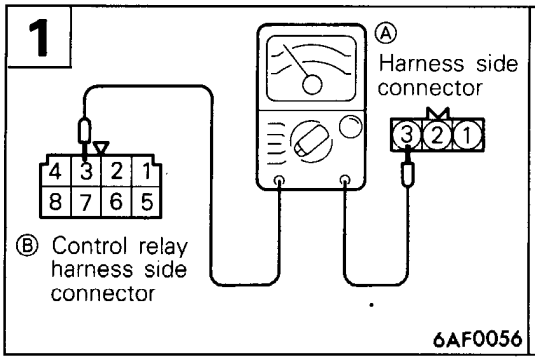
Wave pattern observation points

Examples of abnormal wave patterns

Refer to P.13-90-2

HARNESS INSPECTION

1



6AF0056

Check for continuity between camshaft position sensor and control relay.

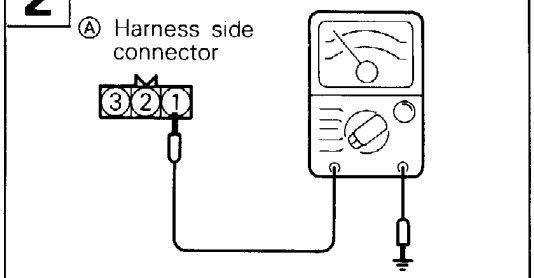
- Camshaft position sensor connector: Disconnected
- Control relay connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK → 2

NG → Repair the harness. (Ⓐ3 – Ⓑ3)

2



6AF0057

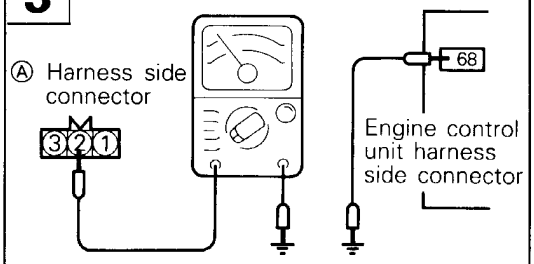
Check for continuity of the earth circuit.

- Camshaft position sensor connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ1 – Earth)

3



6AF0058

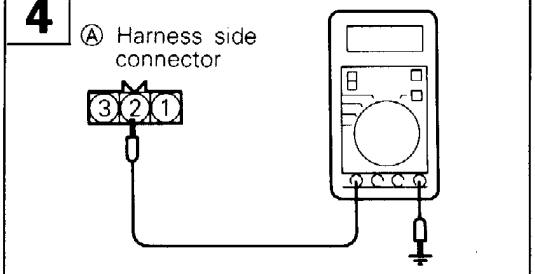
Check for open-circuit or short-circuit to earth, between camshaft position sensor and engine control unit.

- Engine control unit connector: Disconnected
- Camshaft position sensor connecotor: Disconnected

OK → 4

NG → Repair the harness. (Ⓐ2 – 68)

4



6AF0059

Measure the impressed voltage.

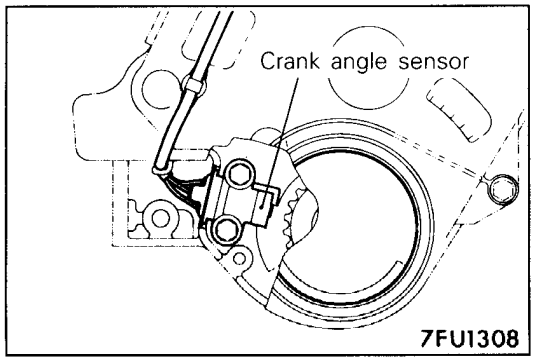
- Camshaft position sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

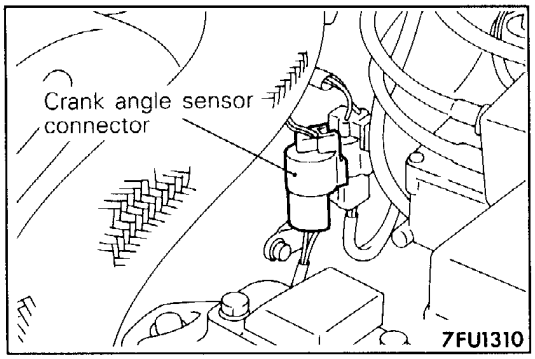
Voltage (V)
4.8–5.2

OK → STOP

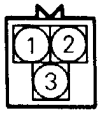
NG → Replace the engine control unit.

CRANK ANGLE SENSOR <DOHC – Vehicles built from December, 1992>

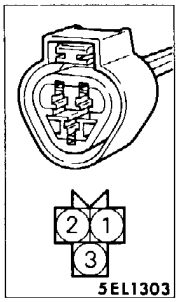


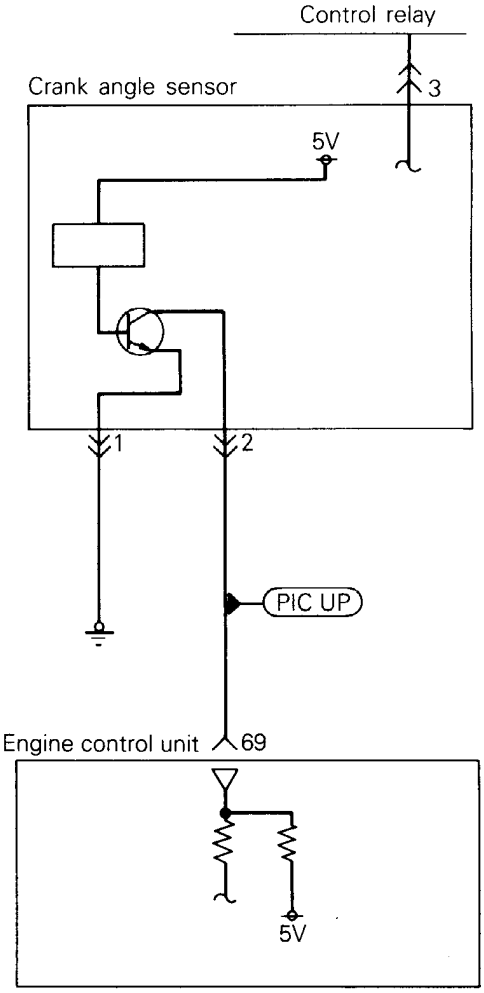


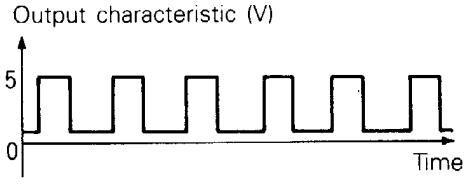
Ⓐ Equipment side connector



Ⓐ Harness side connector



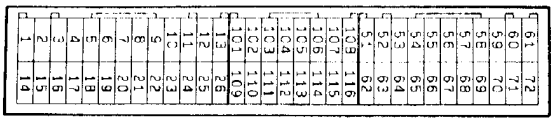




7FU0682

6AF0060

Engine control unit connector



7FU0653

OPERATION

Refer to P.13-92

TROUBLESHOOTING HINTS

Refer to P.13-93

INSPECTION

Using Multi-use Tester (MUT)

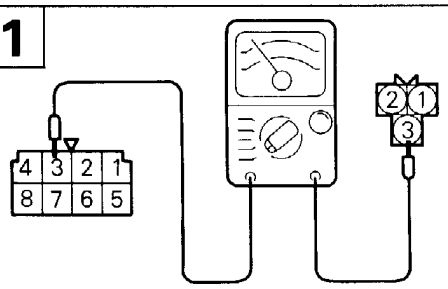
Refer to the crank angle sensor section (P.13-93)

Wave Pattern Inspection Using an Analyzer

Refer to the top dead centre sensor section (P.13-90-1)

HARNESS INSPECTION

1



6AF0061

Check for continuity between crank angle sensor and control relay.

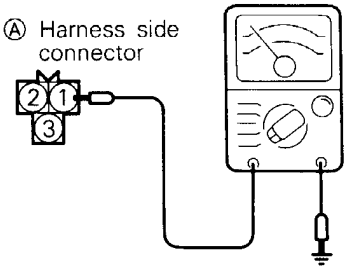
- Crank angle sensor connector: Disconnected
- Control relay connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK → 2

NG → Repair the harness. (Ⓐ3 – Ⓑ3)

2



6AF0062

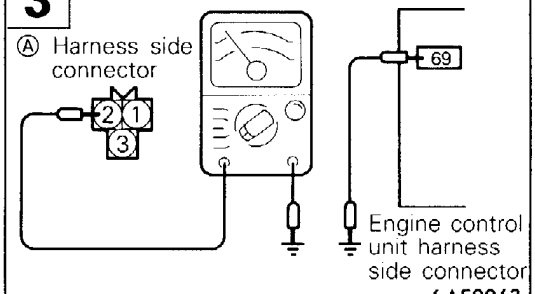
Check for continuity of the earth circuit.

- Crank angle sensor connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ1 – Earth)

3



6AF0063

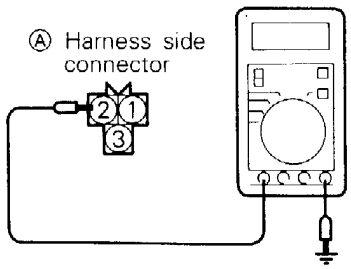
Check for open-circuit or short-circuit to earth, between top dead centre sensor and engine control unit.

- Engine control unit connector: Disconnected
- Crank angle sensor connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓐ2 – 69)

4



6AF0064

Measure the impressed voltage.

- Crank angle sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

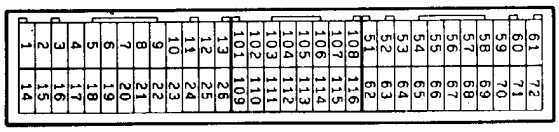
Voltage (V)
4.8–5.2

OK → STOP

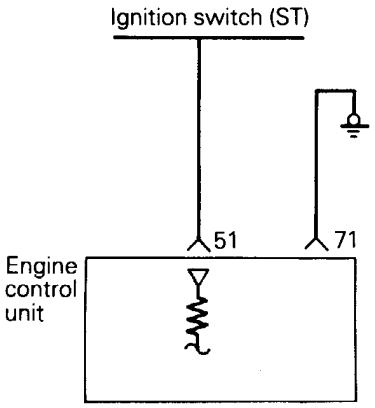
NG → Replace the engine control unit.

NOTES

IGNITION SWITCH-ST <M/T>



7FU0653



1FU0638

OPERATION

- The ignition switch-ST inputs a high signal to the engine control unit while the engine is cranking. The engine control unit provides fuel injection control, etc., at engine startup based on this signal.
- When the ignition switch is set to START, the battery voltage at cranking is applied through the ignition switch to the engine control unit, which detects that the engine is cranking.

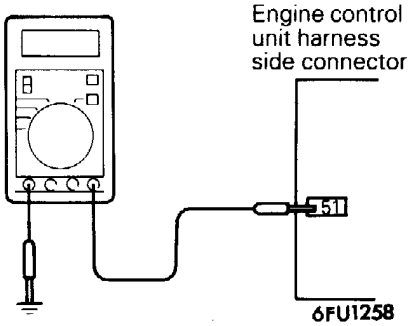
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Engine	Normal indication
Data reading	18	Switch state	Ignition switch: ON	Stop	OFF
				Cranking	ON

HARNESS INSPECTION

1



6FU1258

Measure the input voltage to the engine control unit.

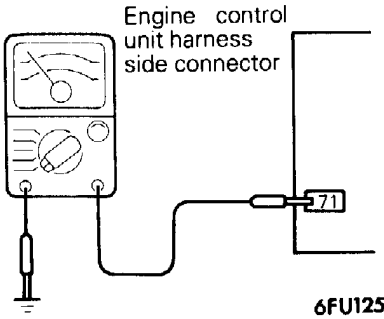
- Engine control unit connector: Disconnected
- Ignition switch: START

Voltage (V)
8 or more

OK → 2

NG → Repair the harness. (51–Ignition switch)

2



6FU1259

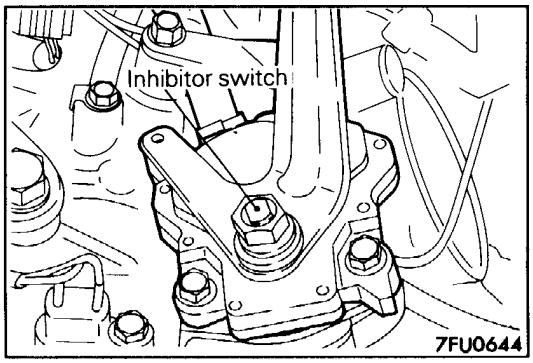
Check for continuity of the earth circuit.

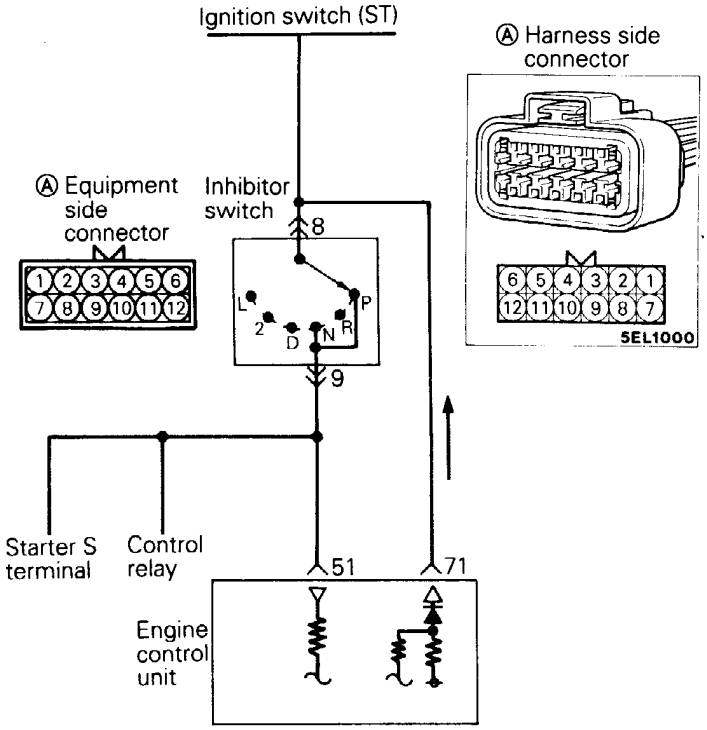
- Engine control unit connector: Disconnected

OK → STOP

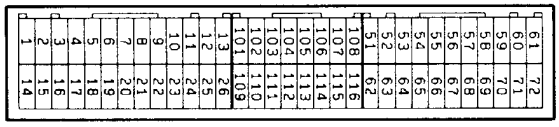
NG → Repair the harness. (71–Earth)

IGNITION SWITCH-ST AND INHIBITOR SWITCH
<A/T> <Vehicles built up to November, 1992>





Engine control unit connector



7FU0653

OPERATION

- The ignition switch-ST inputs a high signal to the engine control unit while the engine is cranking. The engine control unit provides fuel injection control, etc., at engine startup based on this signal.
- When the ignition switch is set to START, the battery voltage at cranking is applied through the ignition switch and inhibitor switch to the engine control unit, which detects that the engine is cranking. In case the selector lever is in a position other than the P/N range, the battery voltage is not applied to the engine control unit.
- The inhibitor switch converts the selector lever position (whether it is at the P/N range or at others) into high/low voltage and inputs it to the engine control unit, which then controls the idle speed control servo based on this signal.
- The battery voltage in the engine control unit is applied through a resistor to the inhibitor switch. When the selector lever is set to the P/N range, continuity is produced between the inhibitor switch terminal of the engine control unit and earth through the starter motor, thereby making the terminal voltage go low.

TROUBLESHOOTING HINTS

If the inhibitor switch harness and individual part check have resulted normal but the inhibitor switch output is abnormal, poorly adjusted control cable is suspected.

INSPECTION

Using Multi-use Tester (MUT)

IGNITION SWITCH-ST

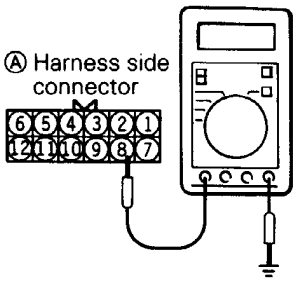
Function	Item No.	Data display	Check condition	Engine	Normal indication
Data reading	18	Switch state	Ignition switch: ON	Stop	OFF
				Cranking	ON

INHIBITOR SWITCH

Function	Item No.	Data display	Check condition	Select lever position	Normal indication
Data reading	29	Shift position	Ignition switch: ON	P or N	P or N
				D,2,L or R	D,2,L or R

HARNESS INSPECTION

1



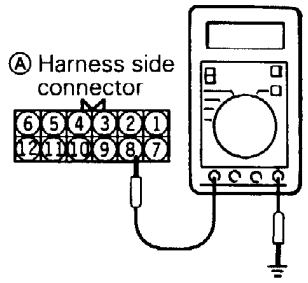
Measure the power supply voltage of the inhibitor switch.
- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected
- Ignition switch: START

Voltage (V)
SV

OK → 2

NO → Check the power supply circuit.

2



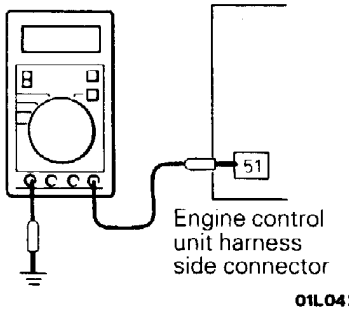
Measure the inhibitor switch terminal input voltage.
- Engine control unit connector: Connected
- Inhibitor switch connector: Disconnected
- Ignition switch: ON

Voltage (V)
SV

OK → 3

NO → Repair the harness. (Ⓐ8–71)

3



Measure the input voltage of engine control unit.
- Engine control unit connector: Disconnected
- Inhibitor switch connector: Connected
- Selector lever: P range
- Ignition switch: START

Voltage (V)
8 or more

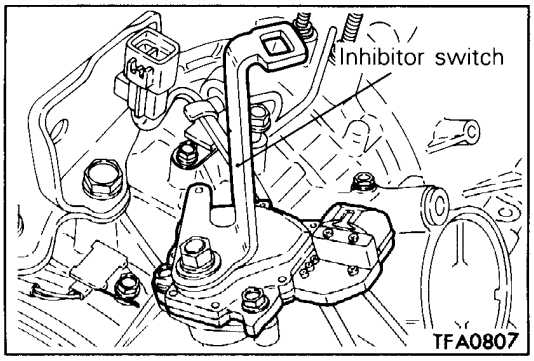
OK → STOP

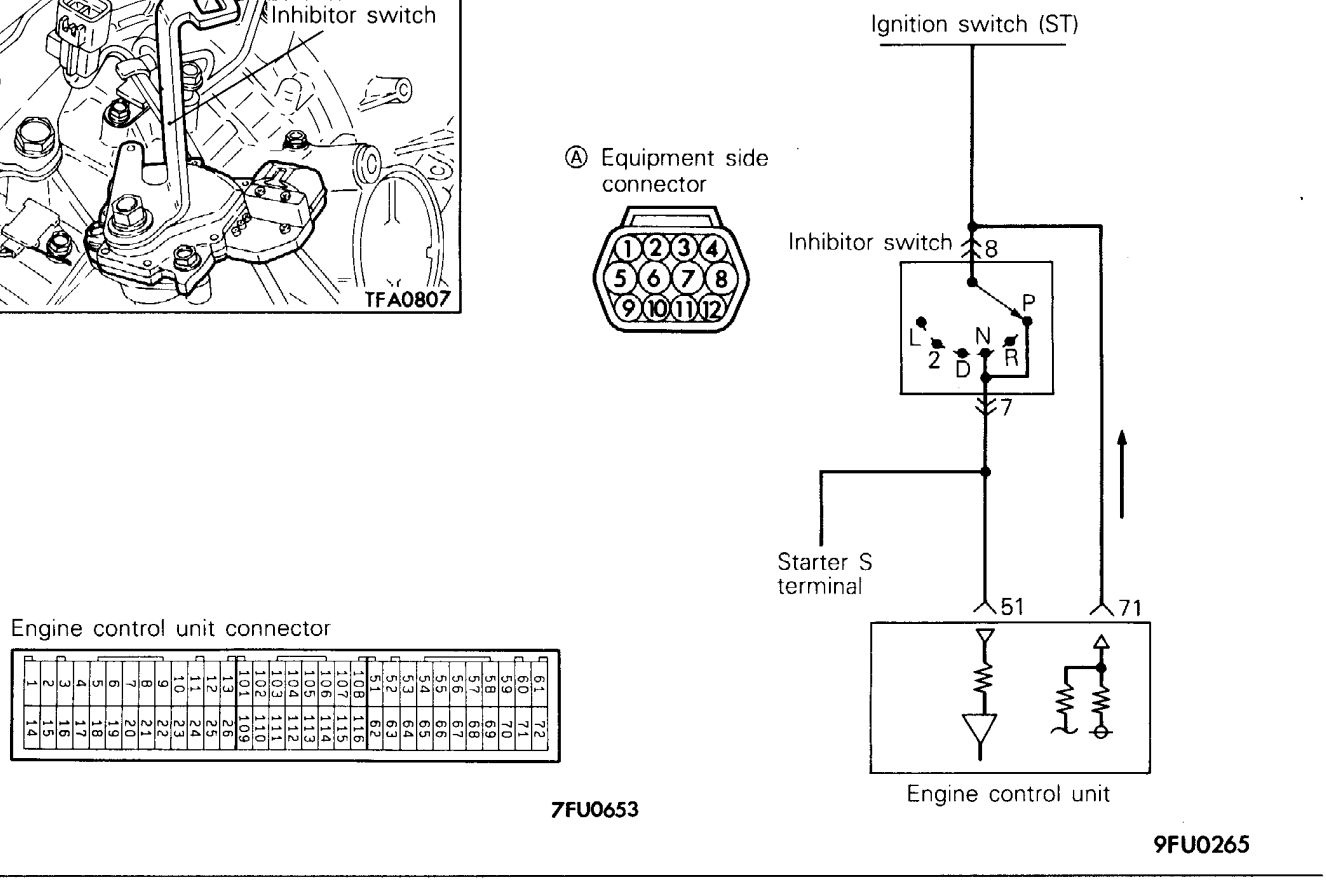
NO → Repair the harness. (Ⓐ9–51)

Inhibitor switch inspection

Refer to GROUP 23–Service Adjustment Procedures.

IGNITION SWITCH-ST AND INHIBITOR SWITCH <A/T> <Vehicles built from December, 1992>





OPERATION

Refer to P. 13-96

TROUBLESHOOTING HINTS

Refer to P. 13-96

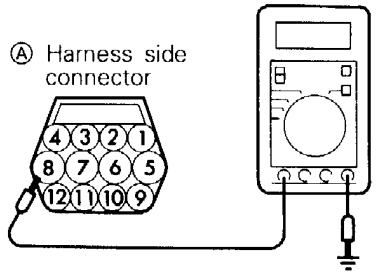
INSPECTION

Refer to P. 13-97

HARNESS INSPECTION

1

Ⓐ Harness side connector



Measure the power supply voltage of the inhibitor switch.

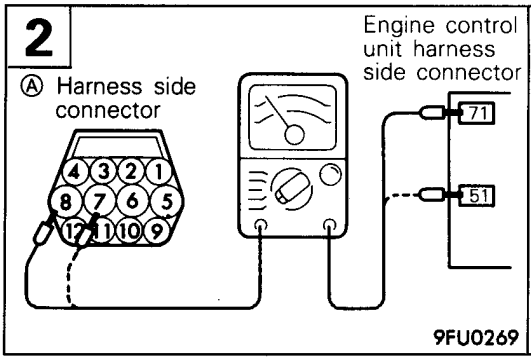
- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected
- Ignition switch: START

Voltage (V)
SV

OK → 2

NG → Check the power supply circuit

2



Check for continuity between inhibitor switch and engine control unit.

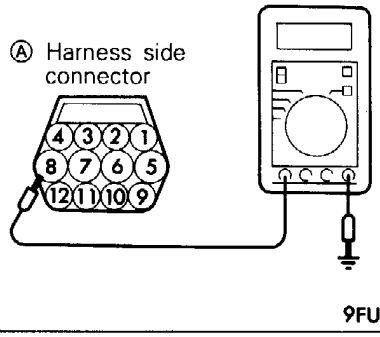
- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK → 3

NO → Repair the harness. (Ⓐ8 – 71) (Ⓐ7 – 51)

3



Measure the impressed voltage to inhibitor switch terminal

- Engine control unit connector: Connected
- Inhibitor switch connector: Disconnected
- Ignition switch: ON

Voltage (V)
SV

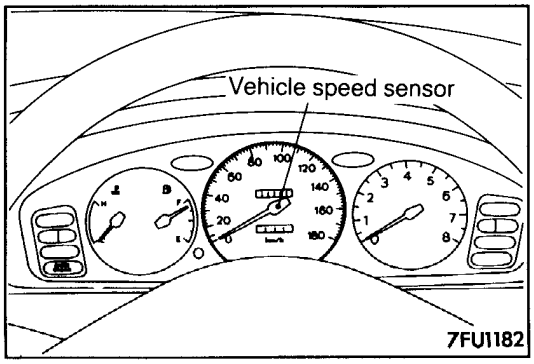
OK → STOP

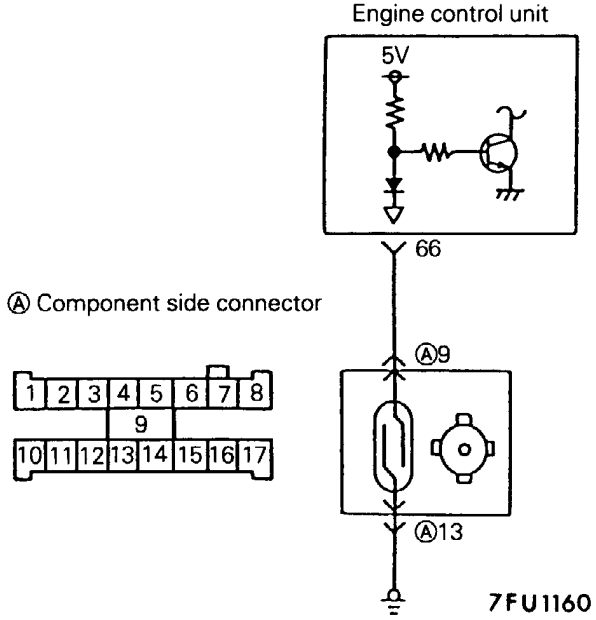
NO → Replace the engine control unit.

Inhibitor switch inspection

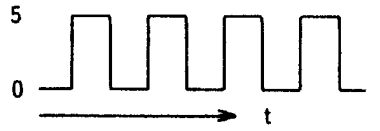
Refer to GROUP 23 – Service Adjustment Procedures.

VEHICLE SPEED SENSOR

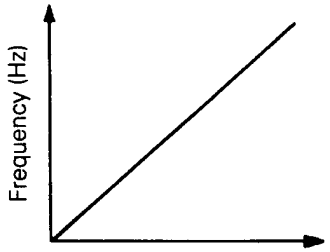




Terminal voltage (V)

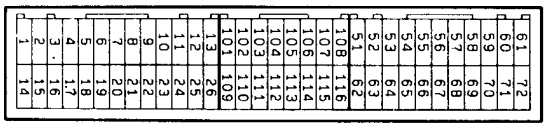


16Z478



16Z451

Engine control unit connector



7FU0653

OPERATION

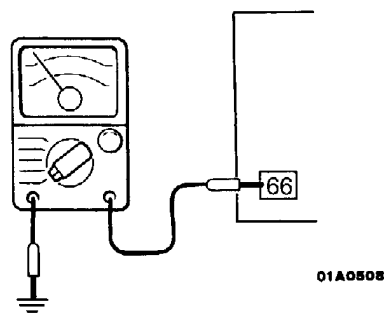
- The vehicle speed sensor which is located in the speedometer converts the vehicle speed into a pulse signal and inputs it to the engine control unit, which then provides the idle speed control, etc. based on this signal.
- The vehicle speed sensor generates the vehicle speed signal by repeatedly opening and closing between the voltage of about 5 V applied from the engine control unit and earth using a reed switch.

TROUBLESHOOTING HINTS

If there is an open or short circuit in the vehicle speed sensor signal circuit, the engine may stall when the vehicle is decelerated to stop.

HARNESS INSPECTION

1



Check the vehicle speed sensor output circuit for continuity.

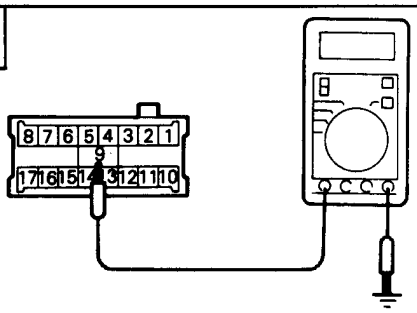
- Engine control unit connector: Disconnected
- Move the vehicle.

Continuity	
Continuity	⎍⎍⎍
Non-continuity	One rotation

OK → STOP

NG → 2

2



6FU1265

Measure the power supply voltage of the vehicle speed sensor.

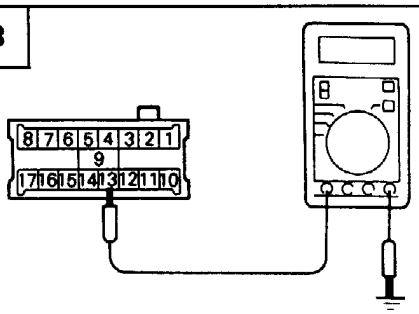
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5–4.9

OK → 3

NG → Repair the harness. (Ⓐ9–66)

3



7FU1161

Check for continuity of the earth circuit.

- Connector: Disconnected

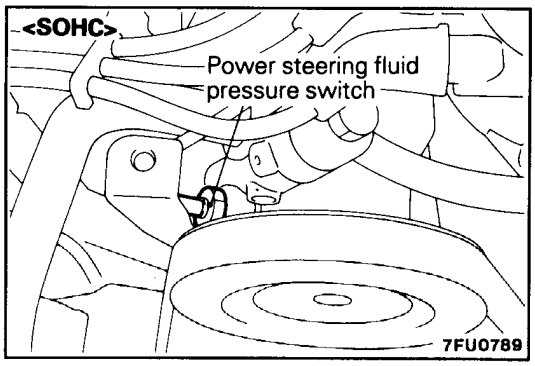
OK → STOP

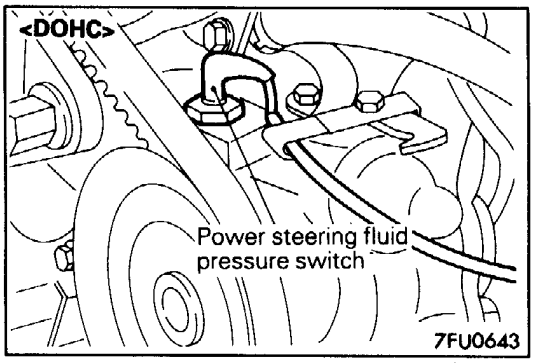
NG → Repair the harness. (Ⓐ13–Earth)

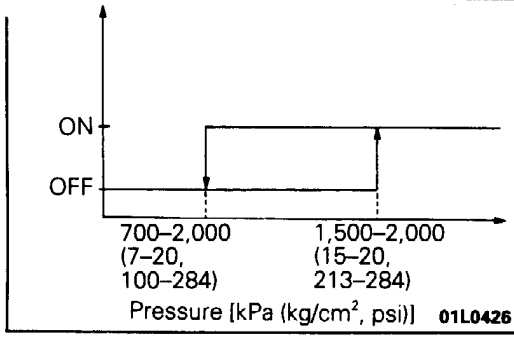
SENSOR INSPECTION

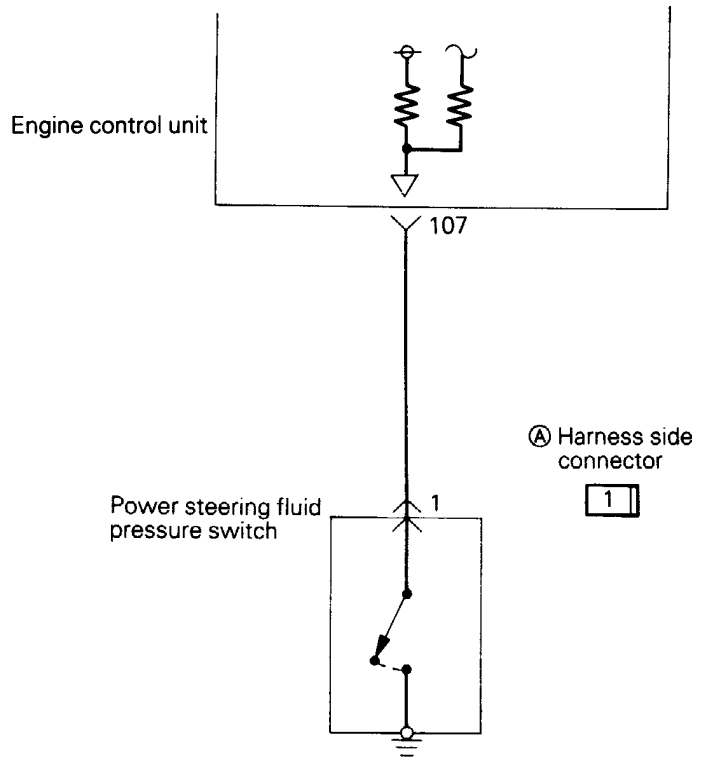
Refer to GROUP 54 – Meters and Gauges.

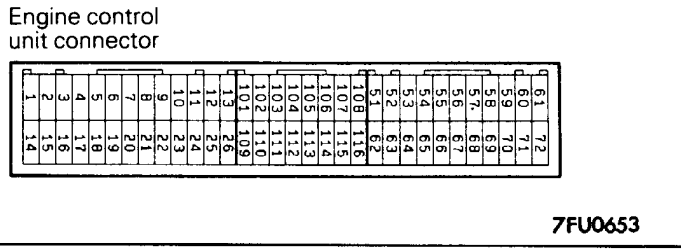
POWER STEERING FLUID PRESSURE SWITCH











OPERATION

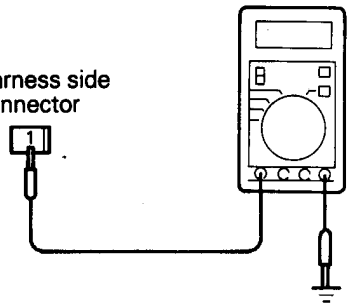
- The power steering fluid pressure switch converts presence/absence of power steering load into low/high voltage and inputs it to the engine control unit, which then controls the idle speed control servo based on this signal.
- The battery voltage in the engine control unit is applied through a resistor to the power steering fluid pressure switch. Steering operation causes the power steering fluid pressure to increase, turning the switch on. As a result, continuity is produced between the battery voltage applied and earth. This causes the power steering fluid pressure terminal voltage to go from high to low.

INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Steering wheel	Normal indication
Data reading	27	Switch state	Engine: Idling	Steering wheel neutral position (wheels straight-ahead direction)	OFF
				Steering wheel half turn	ON

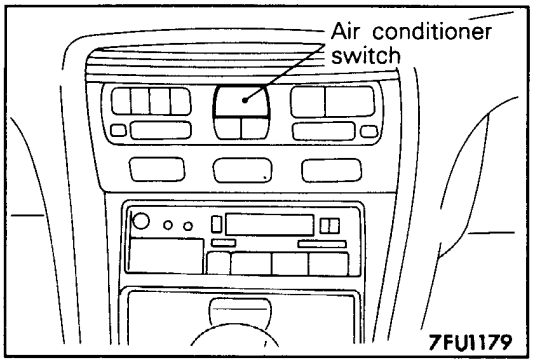
HARNESS INSPECTION

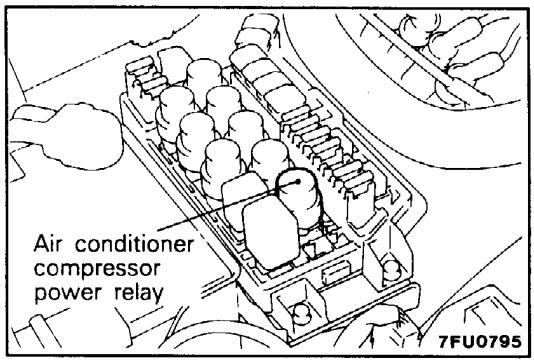
1 Ⓐ Harness side connector  7FU0505	Measure the power supply voltage. • Connector: Disconnected • Ignition switch: ON Voltage (V): System voltage	OK →	STOP
		NG →	Repair the harness. (107 – Ⓐ1)

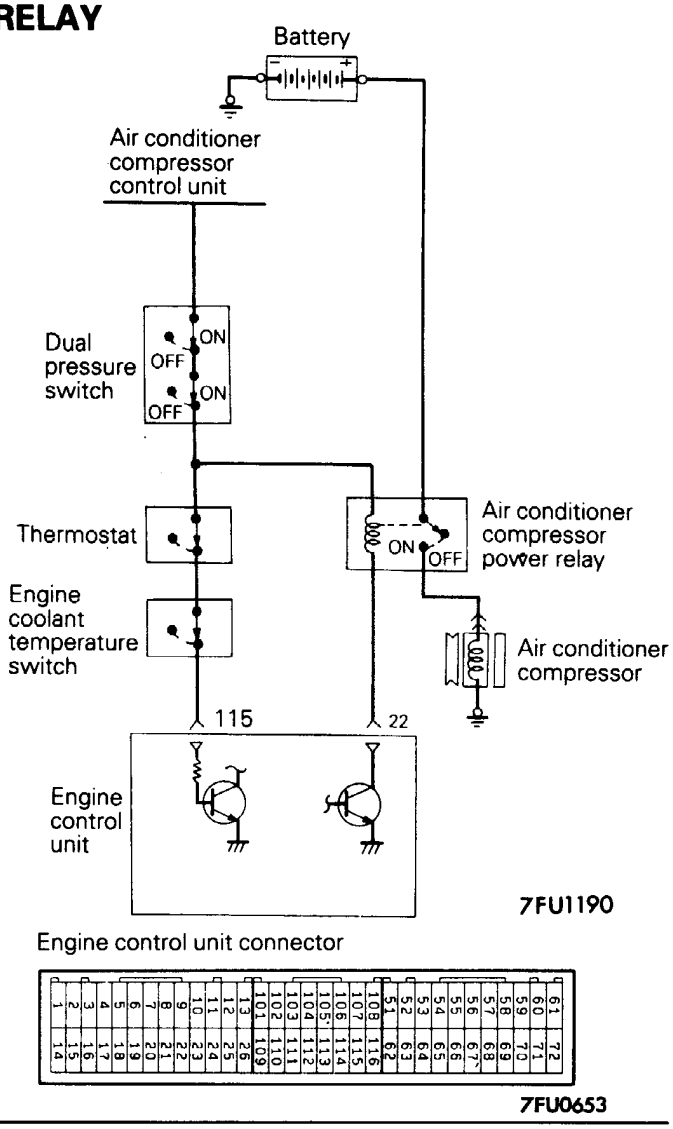
SENSOR INSPECTION

Refer to GROUP 37A – Service Adjustment Procedures.

AIR CONDITIONER SWITCH AND POWER RELAY







OPERATION

- The air conditioner switch applies the battery voltage to the engine control unit when the air conditioner is turned ON.
- When the air conditioner ON signal is input, the engine control unit drives the idle speed control servo and turns ON the power transistor. As a result, the air conditioner compressor power relay coil is energized to turn on the relay switch, which activates the air compressor magnet clutch.

TROUBLESHOOTING HINTS

If the air compressor magnet clutch is not activated when the air conditioner switch is turned ON during idling, faulty air conditioner control system is suspected.

INSPECTION

Using Multi-use Tester (MUT)

AIR CONDITIONER SWITCH

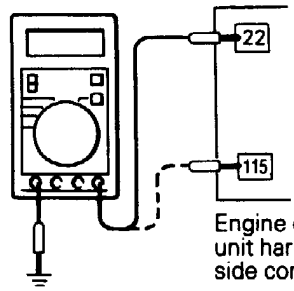
Function	Item No.	Data display	Check condition	Air conditioner switch	Normal indication
Data reading	28	Switch state	Engine: Idling (air compressor to be running when air conditioner switch is ON)	OFF	OFF
				ON	ON

AIR CONDITIONER COMPRESSOR POWER RELAY

Function	Item No.	Data display	Check condition	Air conditioner switch	Normal indication
Data reading	49	Air conditioner compressor power relay state	Engine: Idling after warm-up	OFF	OFF (compressor clutch non-activation)
				ON	ON (compressor clutch activation)

HARNESS INSPECTION

1



Measure the power supply voltage of the air conditioner circuit.

- Air conditioner switch: ON
- Engine control unit connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

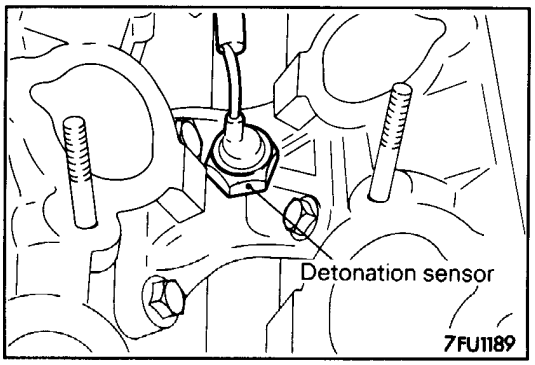
OK → STOP

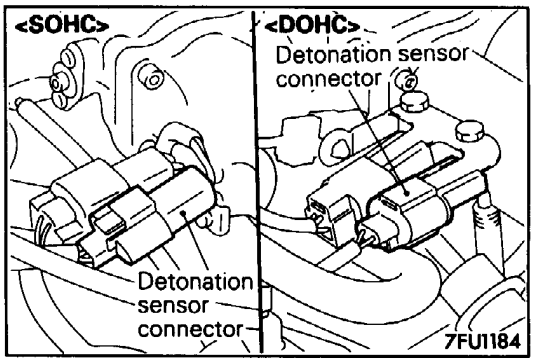
NG → Check the air conditioner circuit.

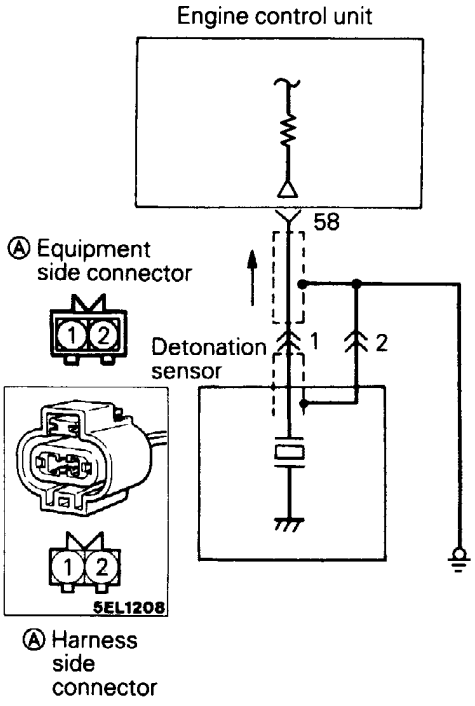
AIR CONDITIONER INSPECTION

Refer to GROUP 55 – Service Adjustment Procedures.

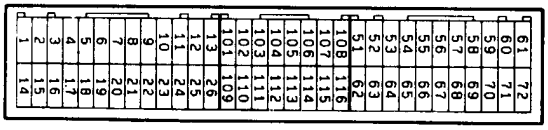
DETONATION SENSOR







Engine control unit connector



7FU0653

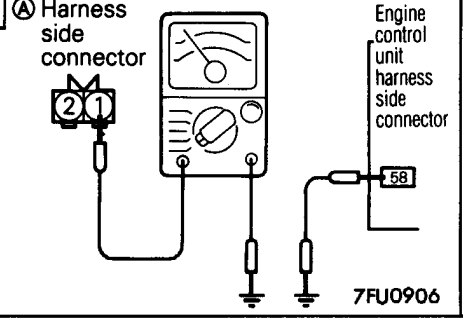
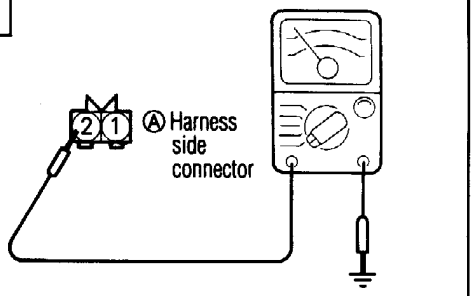
OPERATION

The detonation sensor converts cylinder block vibrations due to knocking into voltage signals according to the strength of the vibration and inputs them to the engine control unit.
The engine control unit controls the delay in ignition timing based on this signal.

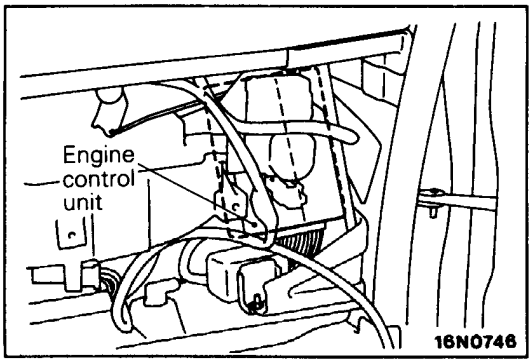
TROUBLESHOOTING HINT

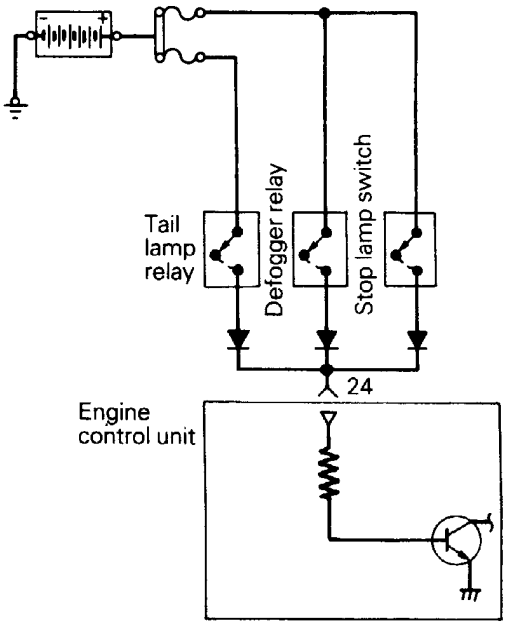
If there is knocking during high load driving, the following malfunctions, in addition to the detonation sensor, can be assumed.
(1) Improper spark plug heating value
(2) Improper gasoline
(3) Incorrect adjustment of standard ignition timing

HARNESS INSPECTION

1		Check for an open-circuit or a short-circuit to ground, between the engine control unit and detonation sensor. • Detonation sensor connector: Disconnect • Engine control unit connector: Disconnect	OK → 2 NG → Repair the harness (Ⓐ1–68)
2		Check for continuity of the earth circuit. • Connector: Disconnect	OK → STOP NG → Repair the harness (Ⓐ2–earth)

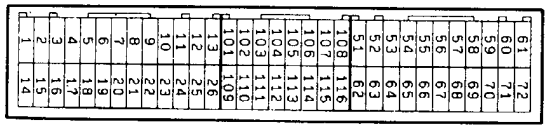
ELECTRIC LOAD SWITCH <DOHC>





7FU0688

Engine control unit connector



7FU0653

OPERATION

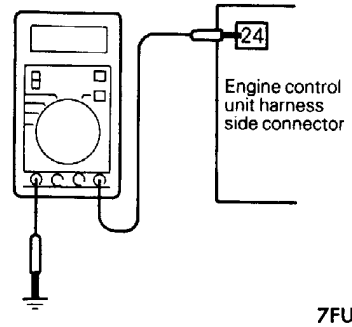
- When there is a device switch which consumes large electricity or has large electrical load during idling, the electrical load switch inputs the ON/OFF signal of the device switch to the control unit.
  The engine control unit controls the idle speed control servo with this signal.
- When device with large electric load is turned ON, battery voltage is supplied to the engine control unit. As a result, the engine control unit detects that a device switch is ON.

INSPECTION
Using multi-use tester (MUT)

Function	Item No.	Data display	Check condition	Accessory condition	Standard value
Data reading	33	Switch condition	• Accessory operation: OFF • Engine Idling	Lighting switch only: OFF → ON	OFF → ON
				Rear defogger switch only: OFF → ON	OFF → ON
				Brake pedal only: from "depressed" to "release"	ON → OFF

HARNESS INSPECTION

1



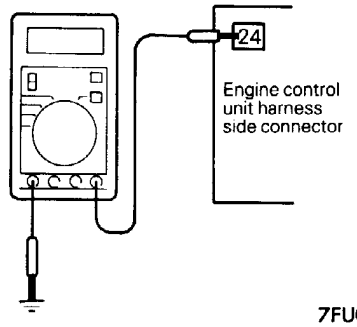
Measure input voltage to engine control unit.
- Engine control unit connector: Disconnect
- Lightning switch: ON (Tail lamp relay goes ON.)

Voltage (V)
System voltage

OK → 2

NO → Tail lamp relay related circuit inspection

2



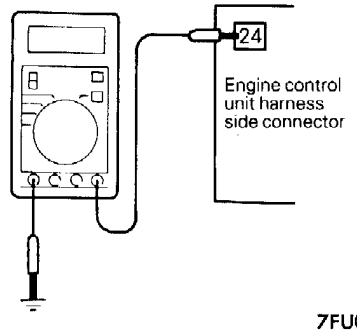
Measure input voltage to engine control unit.
- Engine control unit connector: Disconnect
- Rear defogger switch: ON (Defogger relay goes ON.)

Voltage (V)
System voltage

OK → 3

NO → Defogger relay related circuit inspection

3



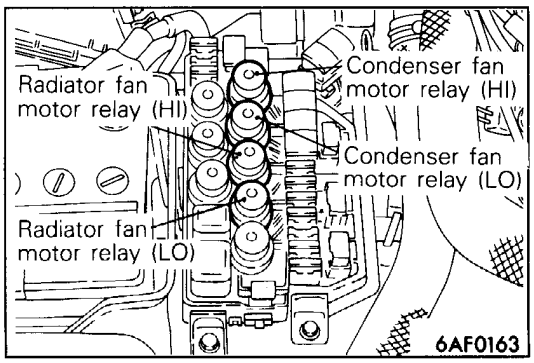
Measure input voltage to engine control unit.
- Engine control unit connector: Disconnect
- Brake pedal: Depressed (Stop lamp relay goes ON.)

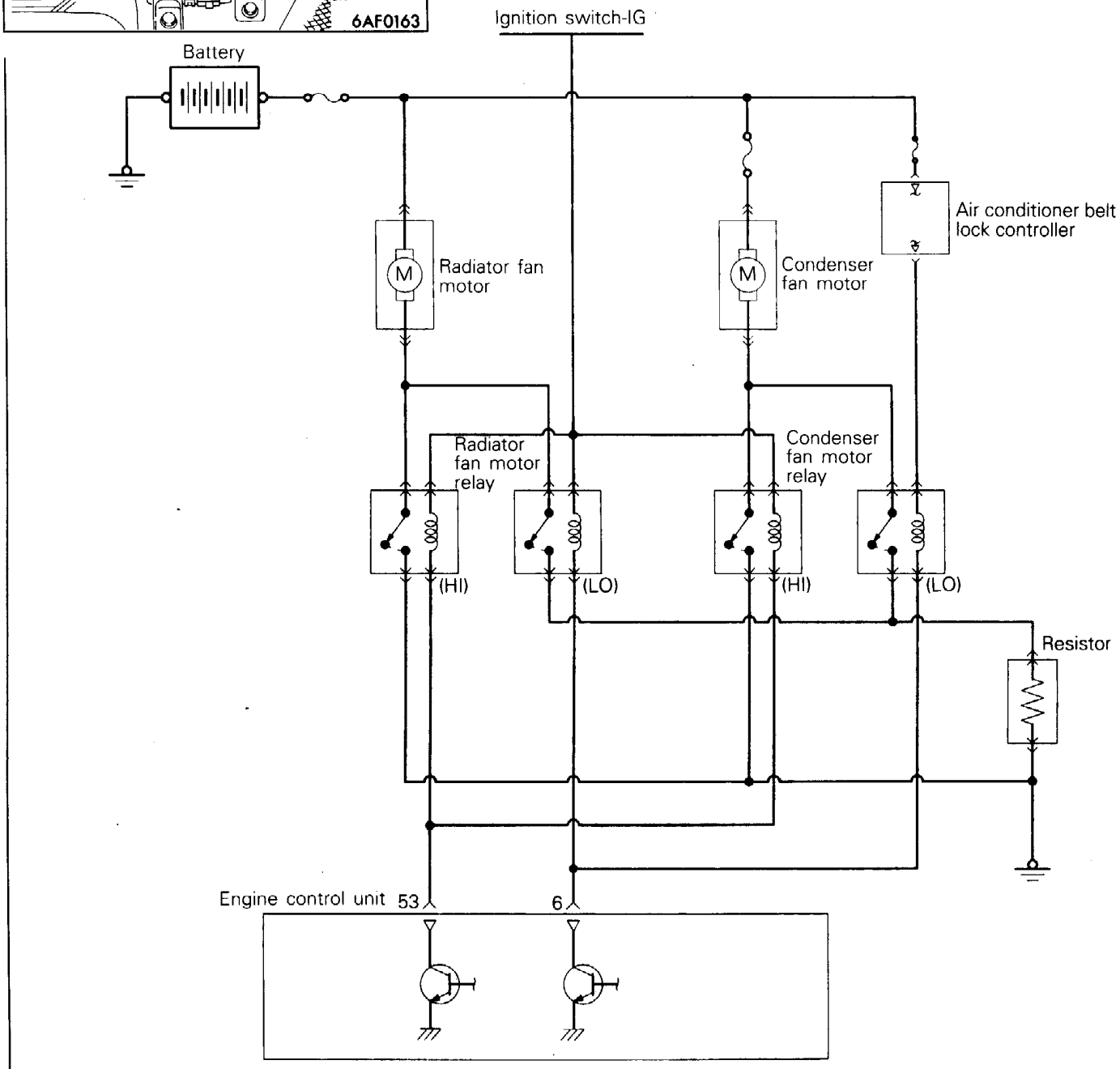
Voltage (V)
System voltage

OK → STOP

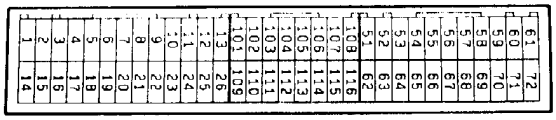
NO → Stop lamp relay and related circuit inspection

FAN MOTOR RELAY (RADIATOR FAN, CONDENSER FAN)





Engine control unit connecter



7FU1414

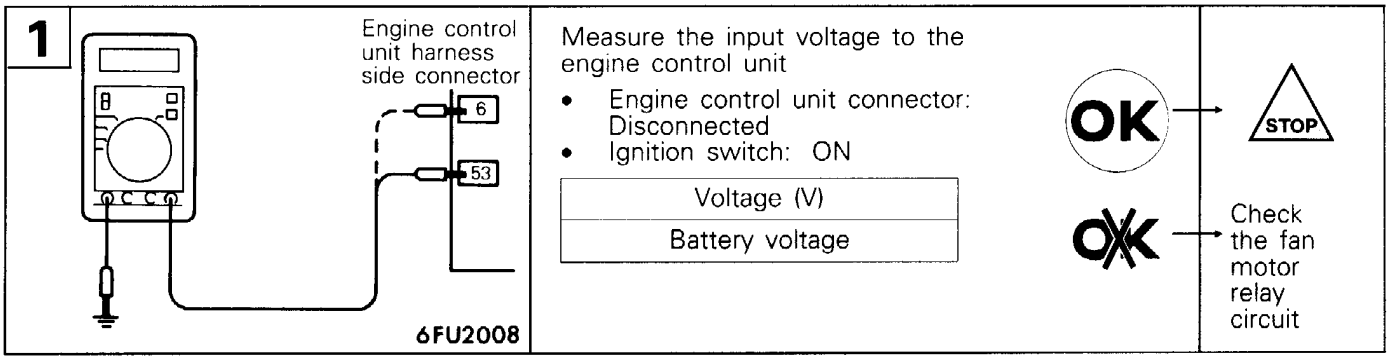
OPERATION

- The engine control unit controls the operation speed of the radiator fan motor and condenser fan motor in accordance with the engine coolant temperature and vehicle speed by controlling the power transistors (low-speed side and high-speed side) inside the engine control unit.
- When the engine control unit turns the low-speed side power transistor inside the engine control unit ON, the radiator fan motor relay (LO) operates and current for driving the radiator fan motor (low-speed operation) is supplied from the battery to the radiator fan motor.
  In addition, when the A/C compressor lock controller outputs current for driving the A/C compressor, the compressor fan motor relay (LO) operates and current for driving the condenser fan motor (low-speed operation) is supplied from the battery to the condenser fan motor.
- When the engine control unit turns the high-speed side power transistor inside the engine control unit ON, the radiator fan motor relay (HI) and condenser fan motor relay (HI) operate and current for driving the radiator fan motor and condenser fan motor (high-speed operation) is supplied from the battery to the radiator fan motor and condenser fan motor.

INSPECTION BY USING MUT

Function	Item No.	Check content	Check condition	Normal state
Actuator test	20	Drive the radiator fan motor and the condenser fan motor at high speed	Ignition switch: ON	The radiator fan motor and the condenser fan motor turn at high speed
	21	Drive the radiator fan motor and the condenser fan motor at low speed	Ignition switch: ON	The radiator fan motor and the condenser fan motor turn at low speed

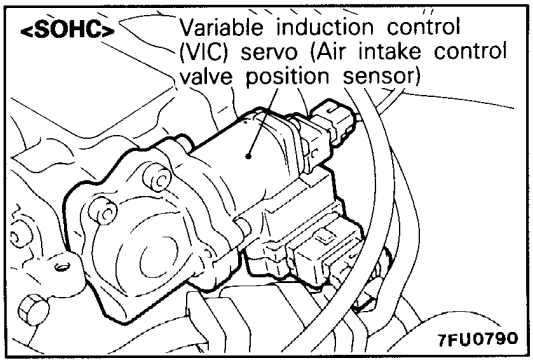
HERNESS INSPECTION

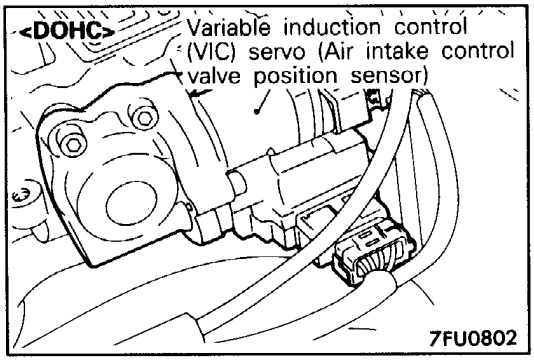


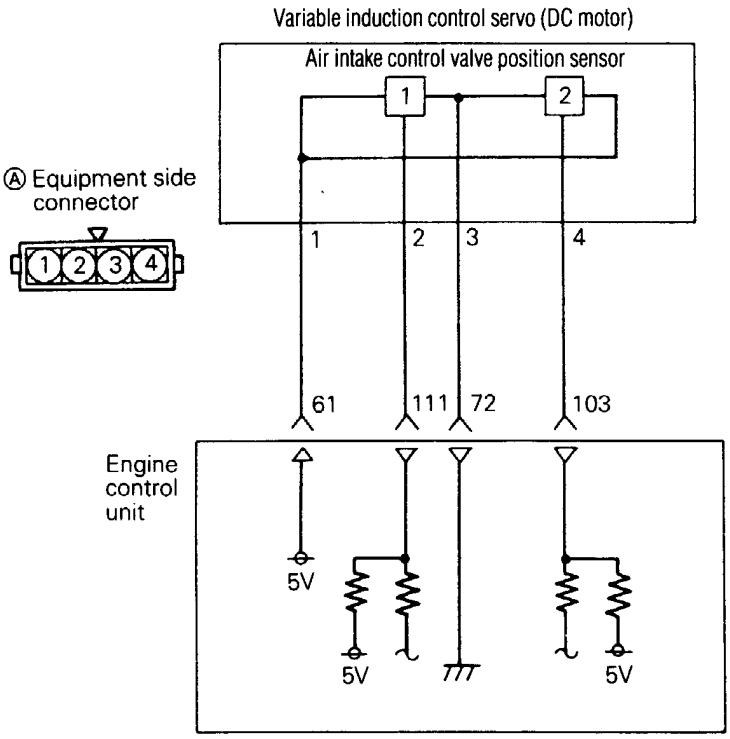
FAN MOTOR RELAY INSPECTION

Refer to GROUP 14 – Radiator and GROUP 55 – Service Adjustment Procedures.

INDUCTION CONTROL VALVE POSITION SENSOR





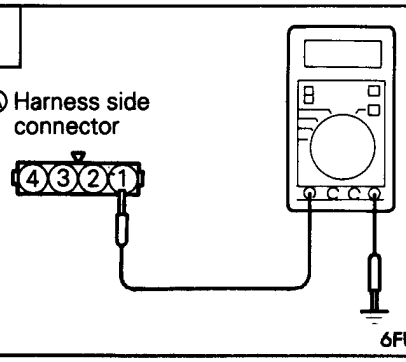


OPERATION

- The air intake control valve position sensor detects the opening of the air intake control valve, converts it to a pulse signal which is input to the engine control unit. The engine control unit controls the opening of the valve with this signal (Variable induction control).
- The air intake control valve position sensor is supplied from the engine control unit with 5 volts of power and earthed to the engine control unit. 5 volts is supplied to the air intake control valve position sensor output terminal (2 terminals) from the engine control unit, and the air intake control valve position sensor generates a pulse signal depending on the opening and closing of the line between the output terminal and earth.

HARNESS INSPECTION

1



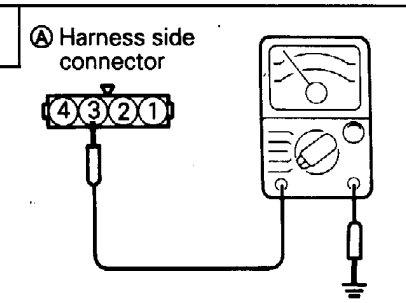
Measure the power supply voltage of the induction valve position sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 2

OK → Repair the harness (Ⓐ1–61)

2

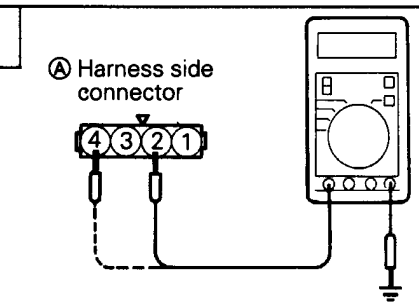


Check continuity of the earth circuit.
- Connector: Disconnect

OK → 3

OK → Repair the harness (Ⓐ3–72)

3



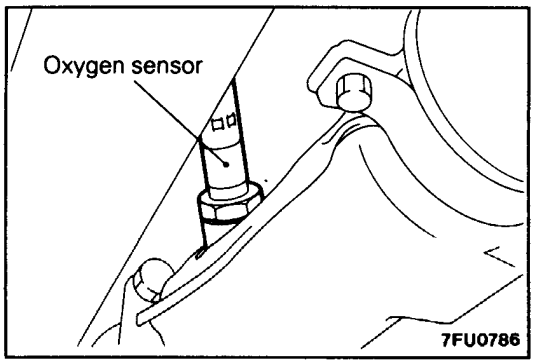
Measure the terminal voltage.
- Connector: Disconnected
- Ignition switch: ON

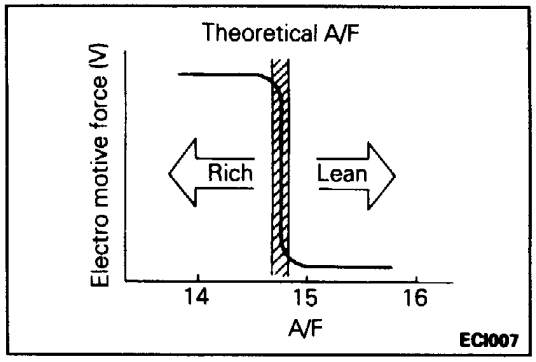
Voltage (V)
4.8–5.2

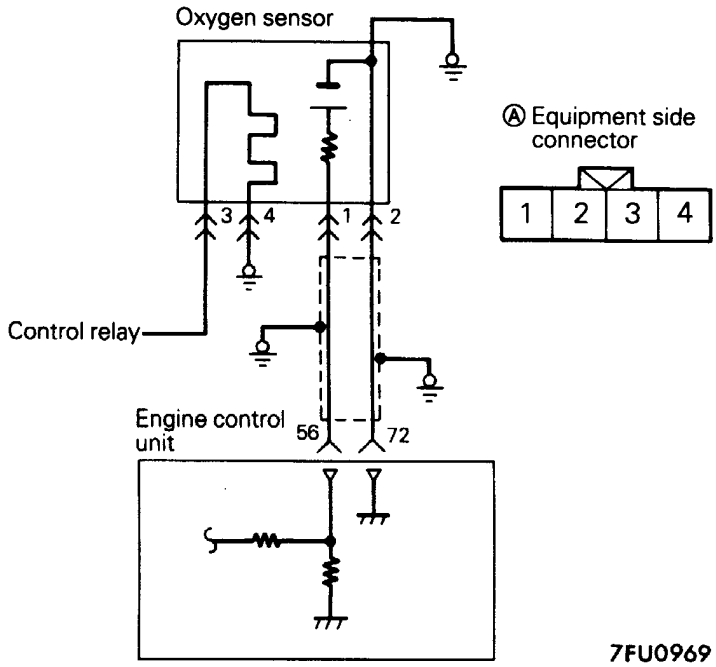
OK → STOP

OK → Repair the harness (Ⓐ2–111, Ⓐ4–103)

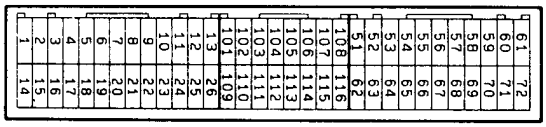
OXYGEN SENSOR







Engine control unit connector



7FU0653

OPERATION

- The oxygen sensor functions to detect the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the engine control unit.
- If the air/fuel mixture ratio is richer than the theoretical air/fuel mixture ratio (i.e., if the concentration of oxygen in the exhaust gas is sparse), a voltage of approximately 1V is output; if the air/fuel mixture ratio in leaner than the theoretical air/fuel mixture ratio (i.e., if the concentration is dense), a voltage of approximately 0V is output.
- The engine control unit, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.
- Battery power supply is applied, by way of the control relay, to the oxygen sensor heater. As a result, the sensor element is heated by the heater, so that the oxygen sensor shows excellent response even if the temperature of the exhaust gas is low.

TROUBLESHOOTING HINTS

Hint 1:
The exhaust gas purification performance will worsen if there is a malfunction of the oxygen sensor.
Hint 2:
If the oxygen sensor output voltage deviates from the standard value even though the results of the checking of the oxygen sensor are normal, the cause is probably a malfunction of a component related to air/fuel mixture ratio control.

Examples:
(1) Malfunction of an injector.
(2) Air leakage into the intake manifold from a leaking gasket.
(3) Malfunction of the air-flow sensor, the intake air temperature sensor, the barometric-pressure sensor, or the coolant temperature sensor.

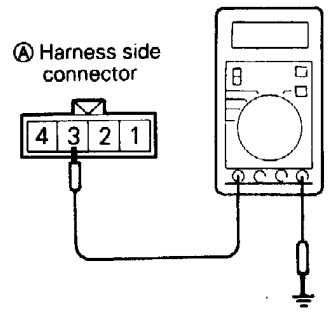
INSPECTION

Using Multi-use tester (MUT)

Function	Item No.	Data display	Check condition	Engine condition	Standard value
Data reading	11	Sensor detection voltage	Engine: Warm-up (Make the mixture lean by engine speed reduction, and rich by racing.)	When sudden deceleration from 4000 r/min.	200 mV or lower
				When engine is suddenly raced	600–1,000 mV
			Engine: warm up (using the oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control unit.)	700 r/min (idling)	400 mV or lower ↕ (changes) 600–1,000 mV
				2,000 r/min	

HARNESS INSPECTION

1



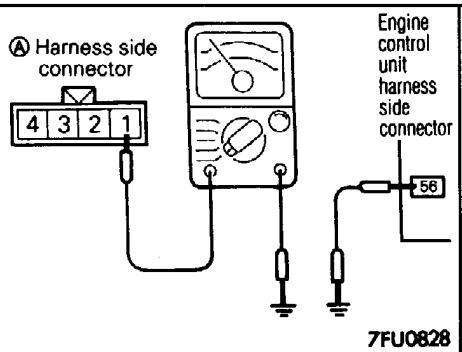
Measure the power supply voltage of the oxygen sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

NG → Repair the harness. (Ⓑ3 – Control relay)

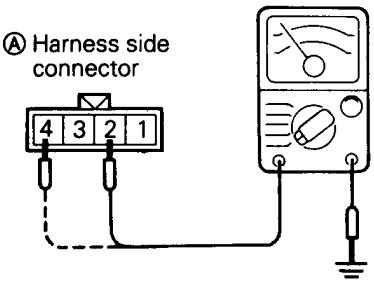
2

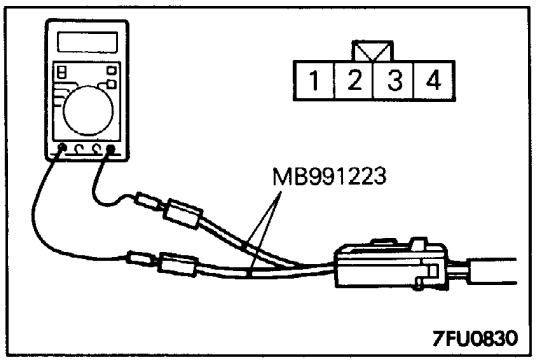


Check for an open-circuit, or a short circuit to earth between the engine control unit and the oxygen sensor.
- Oxygen sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 3

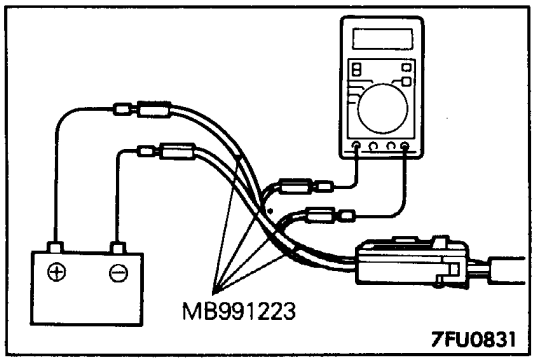
NG → Repair the harness. (Ⓐ1 – 56)

3		
	Check for continuity of the earth circuit. • Connector: Disconnected	OK → STOP NG → Repair the harness. (Ⓐ2–72) (Ⓐ4–earth)



SENSOR INSPECTION

(1) Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
(2) Make sure that there is continuity (approx. 20 Ω at 20°C (68°F) between terminal 3 and terminal 4 on the oxygen sensor connector.
(3) If there is no continuity, replace the oxygen sensor.



(4) Warm up the engine until engine coolant is 80°C (176°F) or higher.
(5) Use jumper wires to connect oxygen sensor terminal 3 (connect to (+) terminal) and terminal 4 (connect to (–) terminal) with the battery (+) terminal and (–) terminal.

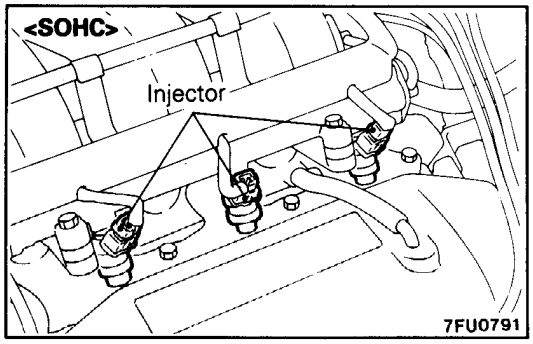
Caution
Be very careful when connecting the jumper wires; incorrect connection can damage the oxygen sensor.

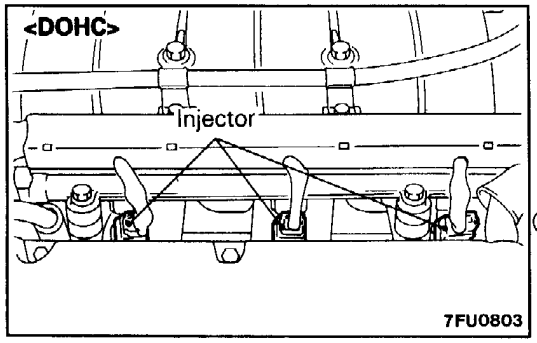
(6) Connect a digital voltage meter between terminal 1 and terminal 2.
(7) While repeatedly racing the engine, measure the oxygen sensor output voltage.

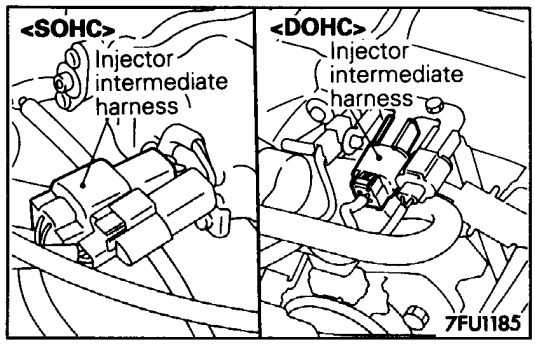
Engine	Oxygen sensor output voltage	Remarks
When racing engine	0.6–1.0V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6–1.0V.

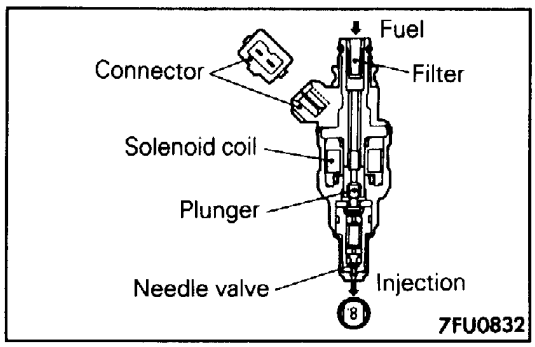
NOTE
• Refer to GROUP 15–Exhaust Manifold for the removal and installation of the oxygen sensor.

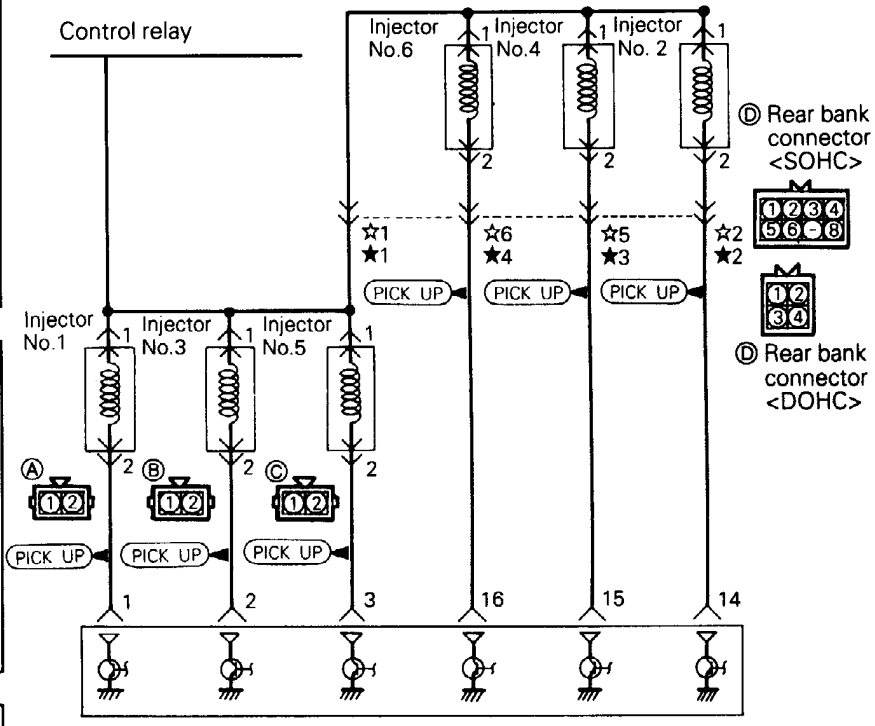
INJECTORS



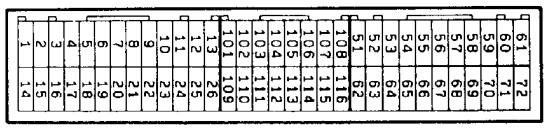








Engine control unit connector



NOTE
☆: Indicates SOHC engine.
★: Indicates DOHC engine.

OPERATION

- The injector is an injection nozzle with a solenoid valve which injects fuel according to the injection signal coming from the engine control unit.
- The injector has a fixed nozzle opening area and the fuel pressure against manifold inside pressure is regulated to a fixed level. Therefore, the volume of fuel injected by the injector is determined by the time during which the needle valve is open, namely, by the time during which the solenoid coil is energized.
- The battery voltage is applied through the control relay to this injector. When the engine control unit turns ON the power transistor in the unit, the solenoid coil is energized to open the injector valve, which then injects fuel.

TROUBLESHOOTING HINTS

Hint 1: If the engine is hard to start when hot, check fuel pressure and check the injector for leaks.

Hint 2: If the injector does not when the engine that is hard to start is cranked, the following as well as the injector itself may be responsible.
(1) Faulty power supply circuit to the engine control unit, faulty earth circuit
(2) Faulty control relay
(3) Faulty crank angle sensor, top dead centre sensor

Hint 3: If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling make following checks about such cylinder.
(1) Injector and harness check
(2) Ignition plug and high tension cable check
(3) Compression pressure check

Hint 4: If the injector harness and individual part checks have resulted normal but the injector drive time is out of specification, the following troubles are suspected.
(1) Poor combustion in the cylinder (faulty ignition plug, ignition coil, compression pressure, etc.)
(2) High engine resistance

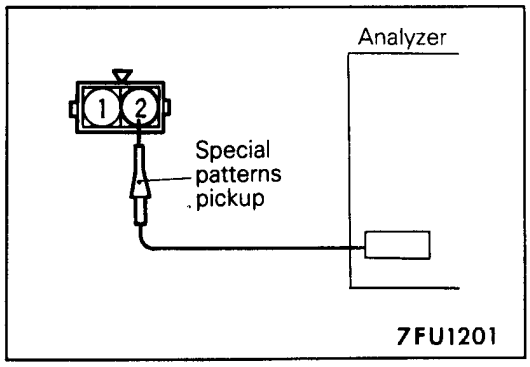
INSPECTION

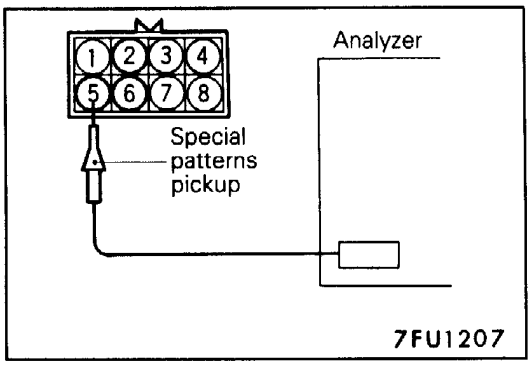
Using Multi-use Tester (MUT)

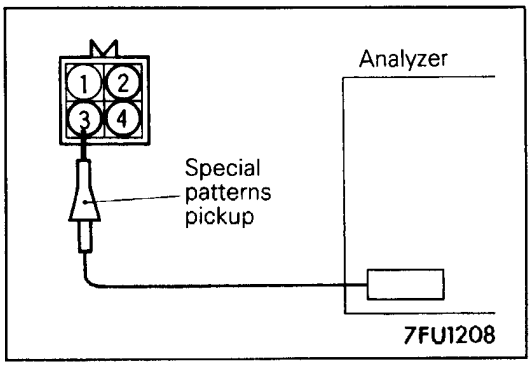
Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	41	Drive time	Engine: Cranking	0°C (32°F)	Approx. 14 ms <SOHC> Approx. 17 ms <DOHC>
				20°C (68°F)	Approx. 40 ms <SOHC> Approx. 46 ms <DOHC>
				80°C (176°F)	Approx. 9 ms <SOHC> Approx. 11 ms <DOHC>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	41	Drive time	• Engine coolant temperature: 80 to 95°C (176 to 205°F) • Lamps, electric cooling fan, accessory units: All OFF • Transmission: Neutral • Steering wheel: Neutral	700r/min (Idle)	2.3–3.5 ms <SOHC> 2.1–3.3 ms <DOHC>
				2,000 r/min	2.1–3.3 ms <SOHC> 1.7–2.9 ms <DOHC>
				When sharp racing is made	To increase

Function	Item No.	Drive content	Check condition	Normal state
Actuator test	01	No. 1 injector shut off	Engine: Idling after warm-up (Shut off the injectors in sequence during after engine warm-up, check the idling condition)	Idle state to change further (becoming less stable or stalling)
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		
	05	No. 5 injector shut off		
	06	No. 6 injector shut off		







Wave Pattern Inspection Using an Analyzer

Measurement method

FOR FRONT BANK CYLINDERS (No.1, No.3, No.5)

(1) Disconnect the injector connector, and connect the special tool (test harness: MB991348) in between. (The power side and the ECU side terminals should both be connected.)

(2) Connect the analyzer special patterns pickup to the ECU test harness clip.

FOR REAR BANK CYLINDERS (No.2, No.4, No.6)

SOHC

(1) Disconnect the injector connector for the rear bank and connect the special tool (test harness MD998474).

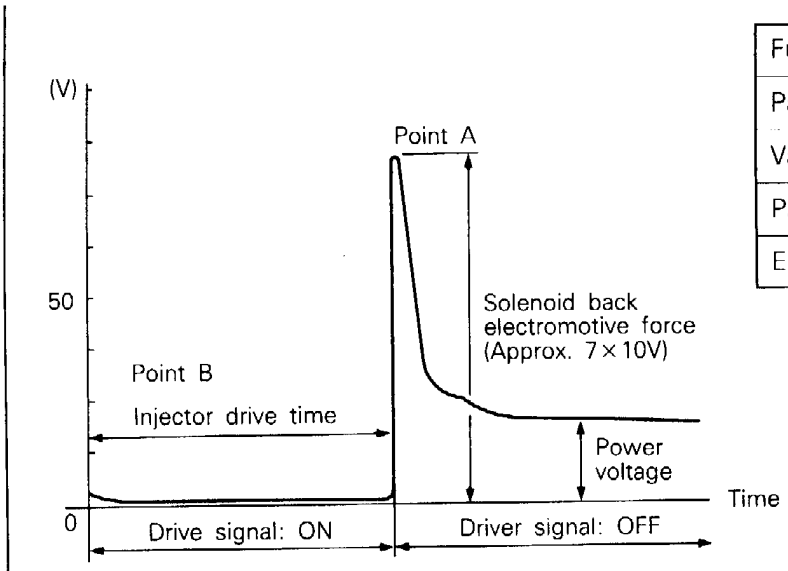
(2) Connect the analyzer special patterns pickup to the male side connector terminal (2) [yellow clip on the special tool (yellow lead wire)] to analyze the No.2 cylinder, terminal (5) [yellow clip (red and yellow lead wire)] for the No.4 cylinder, and terminal (6) [green clip (green and black lead wire)] respectively.

DOHC

(1) Disconnect the injector connector for the rear bank and connect the special tool (test harness MD998464).

(2) Connect the analyzer special patterns pickup to the male side connector terminal (2) (black clip on the special tool) to analyze the No.2 cylinder, connection terminal (3) (blue clip) for No. 4 cylinder, and connection terminal (4) (white clip) for No. 6 cylinder respectively.

Standard wave pattern



7FU1202

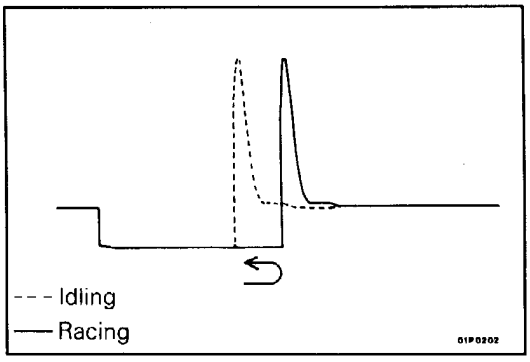
Observation conditions

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust by monitoring wave
Pattern selector	Display
Engine r/min.	Idle r/min. (700 r/min.)

Wave pattern observation points

(Point A): Height of back electromotive force in the solenoid coil

Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

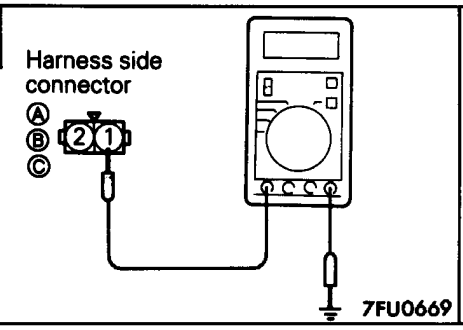


(Point B): Injector drive time

- The injector drive timing will synchronized with the multi-use tester display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.

HARNESS INSPECTION

1



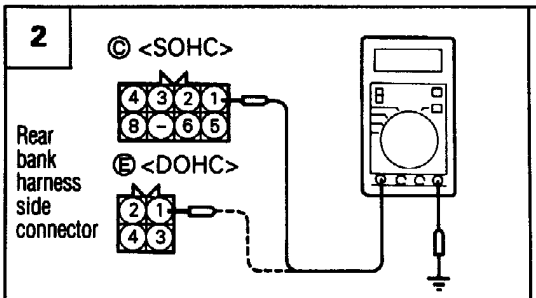
Measure the front bank injector power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

NG → Repair the harness (Ⓐ, Ⓑ, Ⓒ 1 control relay) Check the power supply circuit

2



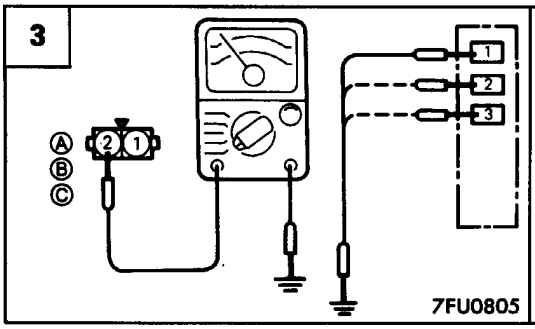
Measure the rear bank injector power source voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 3

NG → Repair the harness
☆ (Ⓓ 1 –Control relay)
★ (Ⓔ 1 –Control relay)

3

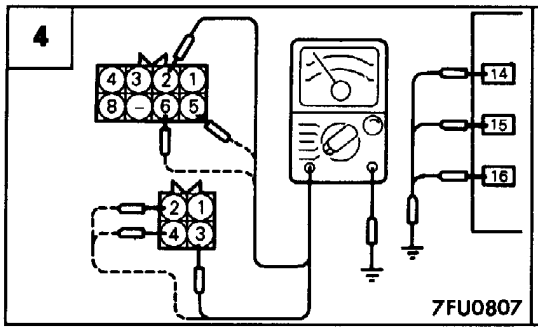


Check for an open-circuit or short circuit between the front bank injector and the engine control unit.
- Injector connector: Disconnected
- Engine control unit Connector: Disconnected

OK → 4

NG → Repair the harness
☆ (ⒶⒷⒸ 2 –1 2 3)
★ (ⒶⒷⒸ 2 –1 2 3)

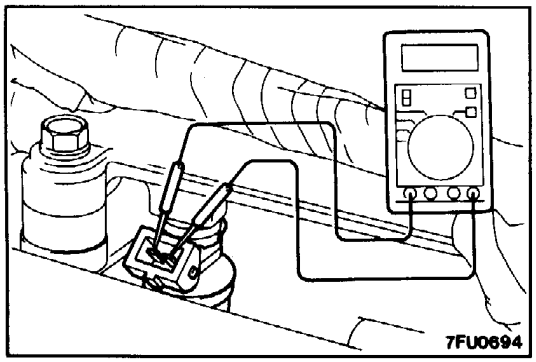
4



Check for an open-circuit or short circuit between the rear bank injector and the engine control unit.
- Connector: Disconnected
- Engine control unit connector: Disconnected

OK → STOP

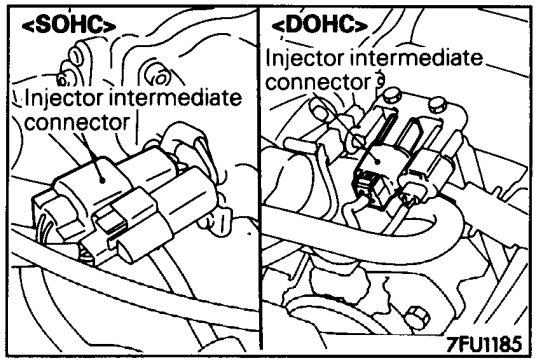
NG → Repair the harness
☆ (Ⓓ 2 5 6 – 14 18 19)
★ (Ⓔ 2 3 4 – 14 18 19)



ACTUATOR INSPECTION

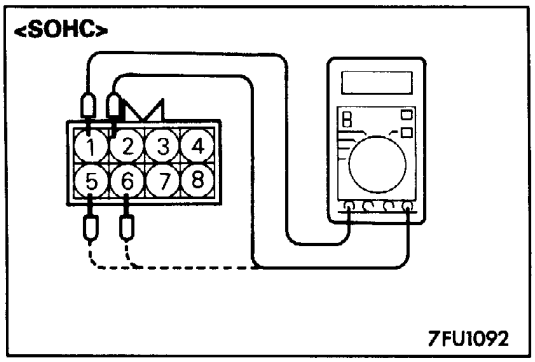
Measurement of resistance between front bank terminals

(1) Disconnect the injector connector
(2) Measure the resistance between the terminals.
Standard value: 13–16 Ω [At 20°C (68°F)]
(3) Connect the injector connector.



Measurement of resistance between rear bank terminals

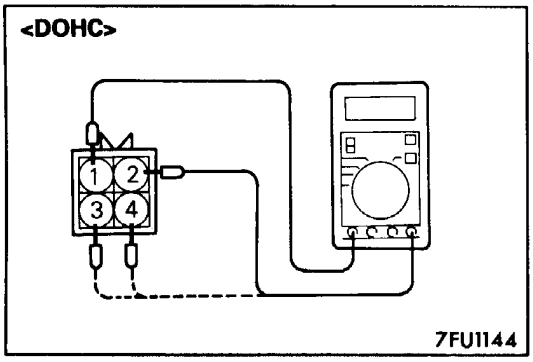
(1) Disconnect the injector intermediate connector.



(2) Measure resistance between terminals.

<SOHC>

Injector No.	Measurement terminal	Resistance
No. 2	①–②	13–16 Ω [At 20°C (68°F)]
No. 4	①–⑤	
No. 6	①–⑥	



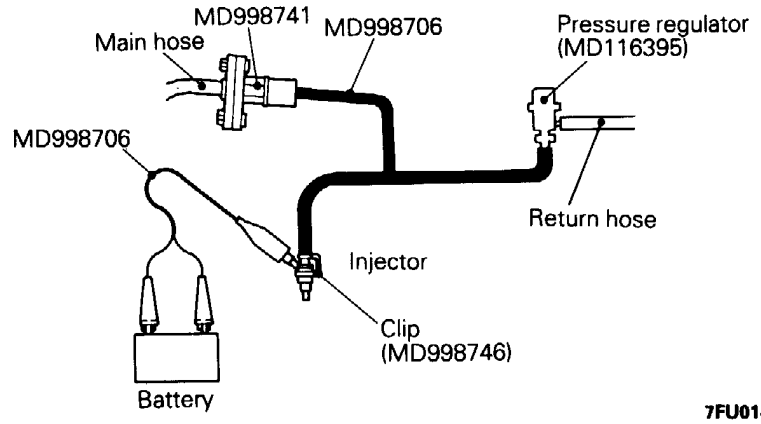
<DOHC>

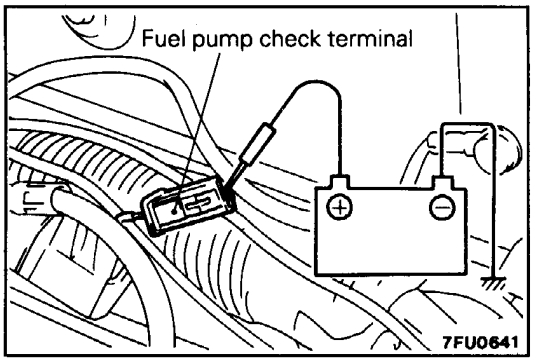
Injector No.	Measurement terminal	Resistance
No. 2	①–②	13–16 Ω [At 20°C (68°F)]
No. 4	①–③	
No. 6	①–④	

(3) Connect the injector connector.

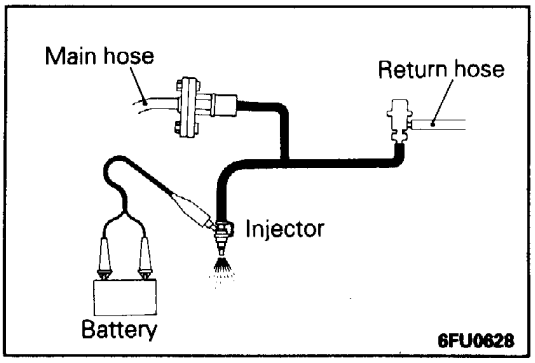
Checking the Injection Condition

(1) Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-51)
(2) Remove the injector.
(3) Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clip as shown in the illustration below.

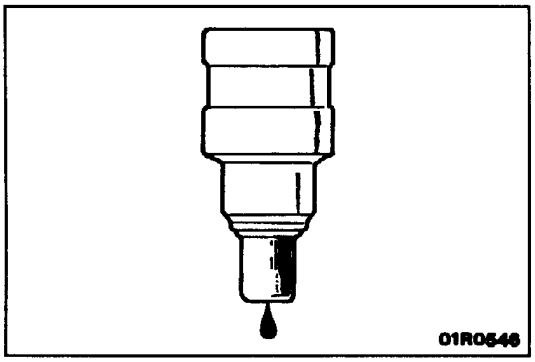




(4) Connect the battery's negative (–) terminal.
(5) Apply battery voltage to the fuel pump check terminal (black) and activate the fuel pump.

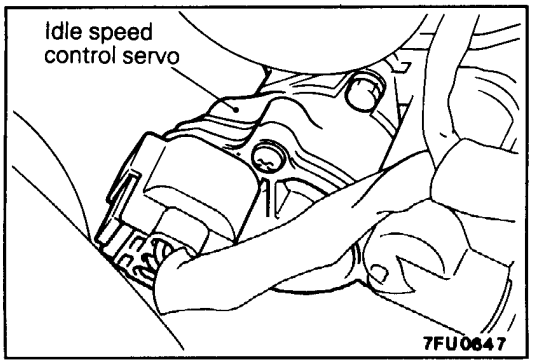


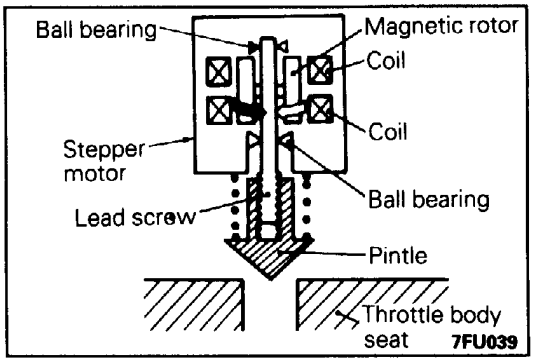
(6) Activate the injector and check the atomized spray condition of the fuel.
The condition can be considered satisfactory unless it is extremely poor.

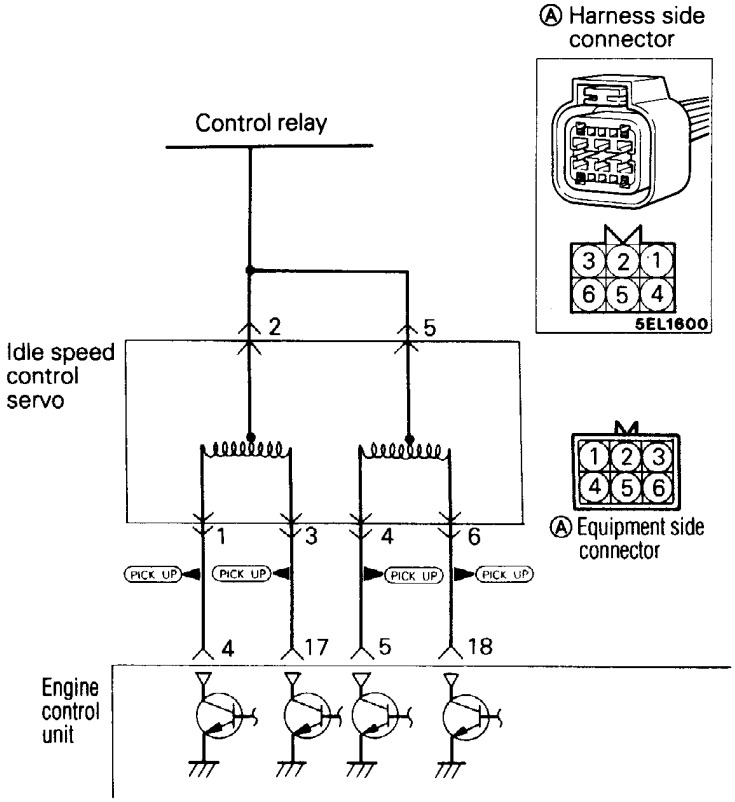


(7) Stop the actuation of the injector, and check for leakage from the injector's nozzle.
Standard value: 1 drop or less per minute
(8) Activate the injector without activating the fuel pump; then, when the spray emission of fuel from the injector stops, disconnect the special tool and restore it to its original condition.

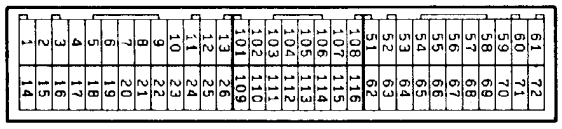
IDLE SPEED CONTROL SERVO (STEPPER MOTOR)







Engine control unit connector



OPERATION

- The intake air volume during idling is controlled by opening or closing the servo valve provided in the air path that bypasses the throttle valve.
- The servo valve is opened or closed by operating the stepper motor in the speed control servo in normal or reverse direction.
- The battery power is supplied to the stepper motor through the control relay. As the engine control unit turns on power transistors in the unit one after another, the stepper motor coil is energized and the motor rotates in normal or reverse direction.

TROUBLESHOOTING HINTS

Hint 1: If the stepper motor step increases to 100 to 120 steps or decreases to 0 step, faulty stepper motor or open circuit in the harness is suspected.

Hint 2: If the idle speed control servo harness and individual part checks have resulted normal but the stepper motor steps are out of specification, the following faults are suspected.

(1) Poorly adjusted reference idle speed
(2) Deposit on the throttle valve
(3) Air leaking into the intake manifold through gasket gap
(4) Poor combustion in the cylinder (faulty ignition plug, ignition coil, injector, low compression pressure, etc.)

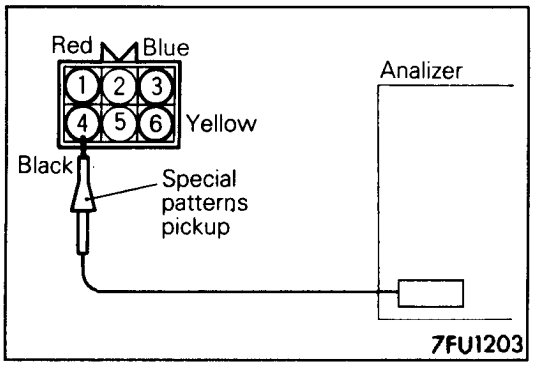
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Data display	Check condition	Load state	Standard value
Data reading	45	Stepper motor steps	• Engine coolant temperature: 80 to 95°C (176 to 205°F) • Lamps, electric cooling fan, accessory units: All OFF • Transmission: Neutral (For A/T vehicles: P range) • Steering wheel: Neutral • Idle position switch: ON (compressor clutch to be ON if air conditioner switch is ON) • Engine: Idling	Air conditioner switch: OFF	2–25 stp
				Air conditioner switch: OFF → ON	Increase by 10–70 stp
				Air conditioner switch: OFF Selector lever: N to "D" range.	Increase by 5–50 stp

NOTE
(1) When the vehicle is new [within initial operation of about 500 km (300 miles)], the stepper motor steps may be about 30 steps more than standard.

Caution
Apply the brake so the vehicle does not move foreword when shifting the shift lever to the D range.



Wave Pattern Inspection Using an Analyzer

Measurement method

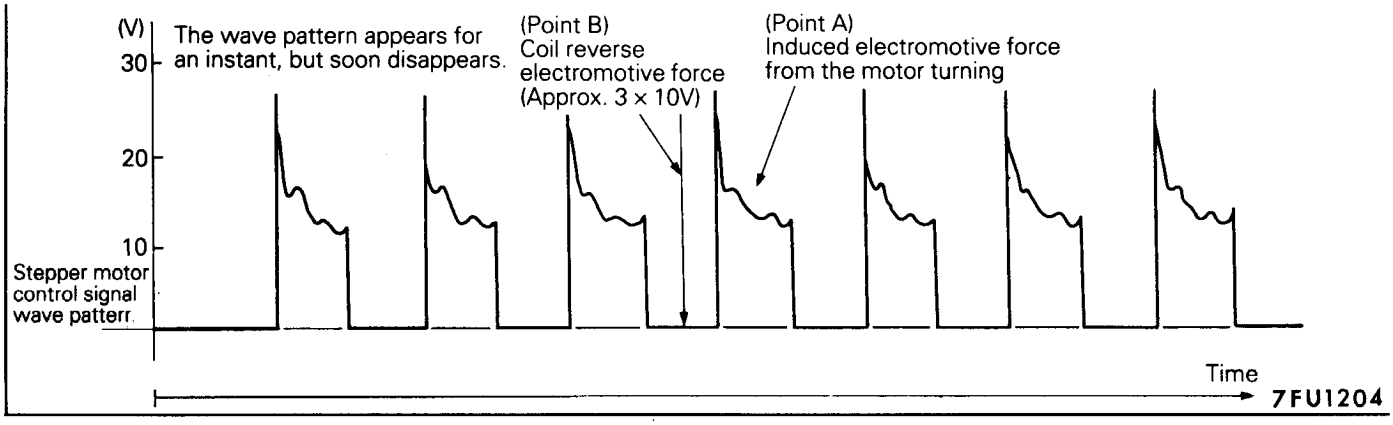
(1) Disconnect the stepper motor connector, and connect the special tool (test harness: MB998463) in between .

(2) Connect the analyzer special patterns pickup to the stepper motor-side connector terminal ① (red clip on the special tool), terminal ③ (blue clip), terminal ④ (black clip) and terminal ⑥ (yellow clip) respectively.

Standard wave pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the air conditioner switch to ON.
	Immediately after starting the warm engine (approx. 1 minute).



Wave pattern observation points

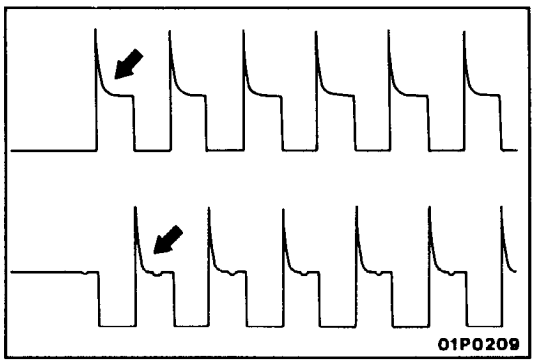
Check that the standard wave pattern appears when the stepper motor is operating.

(Point A): Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

(Point B): Height of coil reverse electromotive force

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in the coil



Abnormal wave pattern

Cause of problem

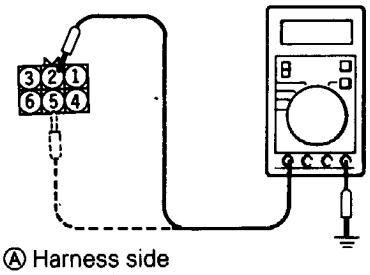
Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.

HARNESS INSPECTION

1



Measure the power supply voltage of idle speed control servo.

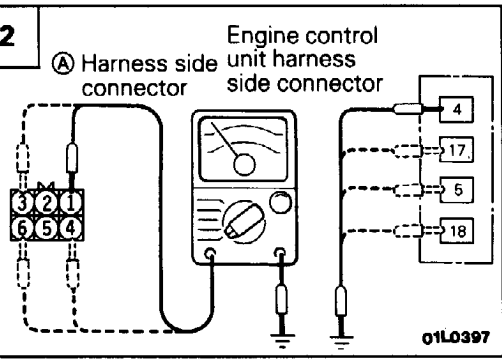
- Idle speed control servo connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

NG → Repair the harness. (Control relay – Ⓐ2) (Control relay– Ⓐ5)

2

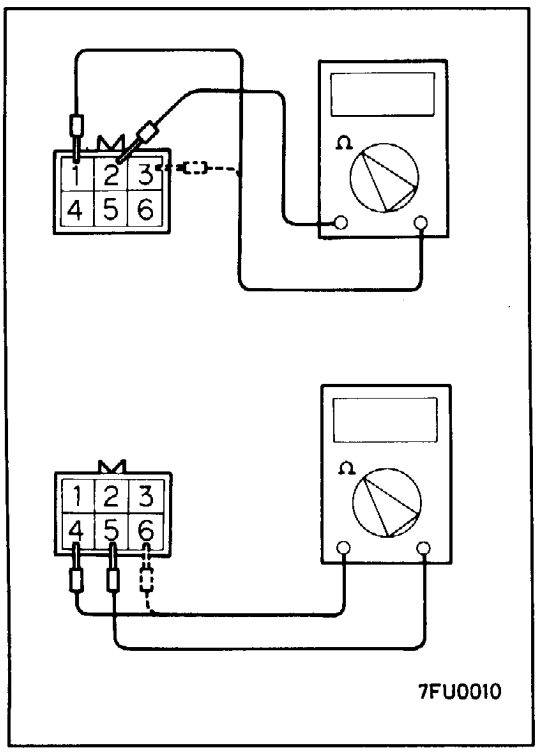


Check for an open-circuit, or a short-circuit to earth between the engine control unit and the idle speed control servo.

- Engine control unit connector: Disconnected
- Idle speed control servo connector: Disconnected

OK → STOP

NG → Repair the harness. (Ⓐ1–4) (Ⓐ3–17) (Ⓐ4–5) (Ⓐ6–18)



ACTUATOR INSPECTION

Checking the Operation Sound

(1) Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but without starting the motor).
(2) If the operation sound cannot be heard, check the stepper motor's activation circuit.
If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control unit.

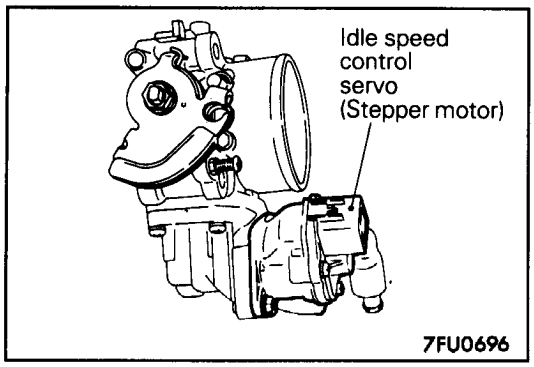
Checking the Coil Resistance

(1) Disconnect the idle speed control servo connector and connect the special tool (test harness).
(2) Measure the resistance between terminal ② (white clip of the special tool) and either terminal ① (red clip) or terminal ③ (blue clip) of the connector at the idle speed control servo side.

Standard value: 28–33 Ω at 20°C (68°F)

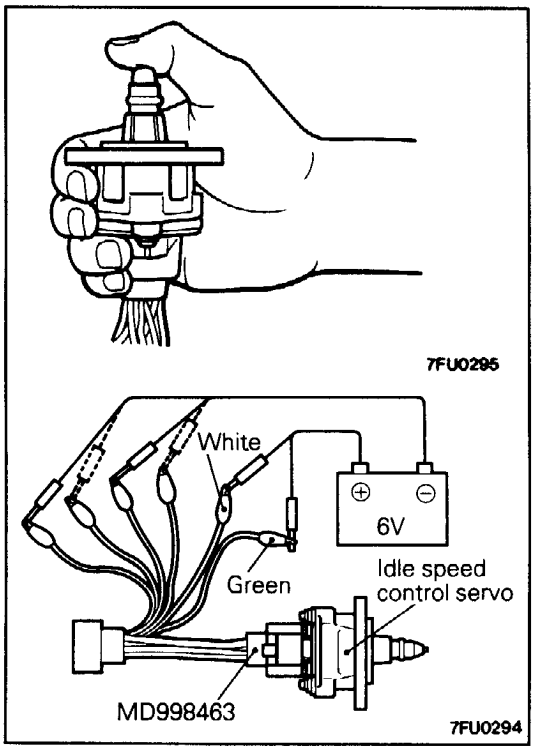
(3) Measure the resistance between terminal ⑤ (green clip of the special tool) and either terminal ⑥ (yellow clip) or terminal. ④ (black clip) of the connector at the idle speed control servo side.

Standard value: 28–33 Ω at 20°C (68°F)



Operational Check

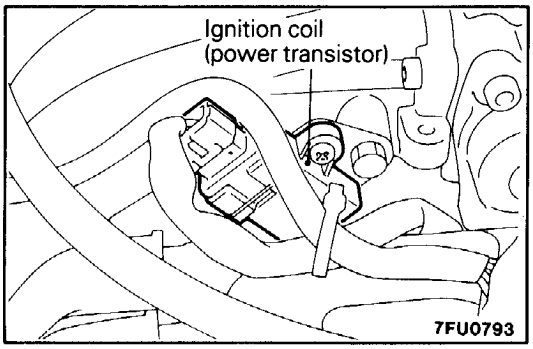
(1) Remove the throttle body.
(2) Remove the stepper motor.

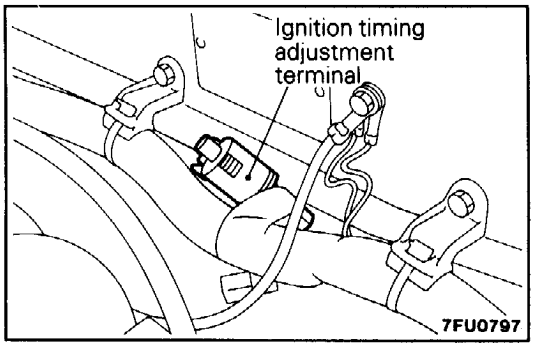


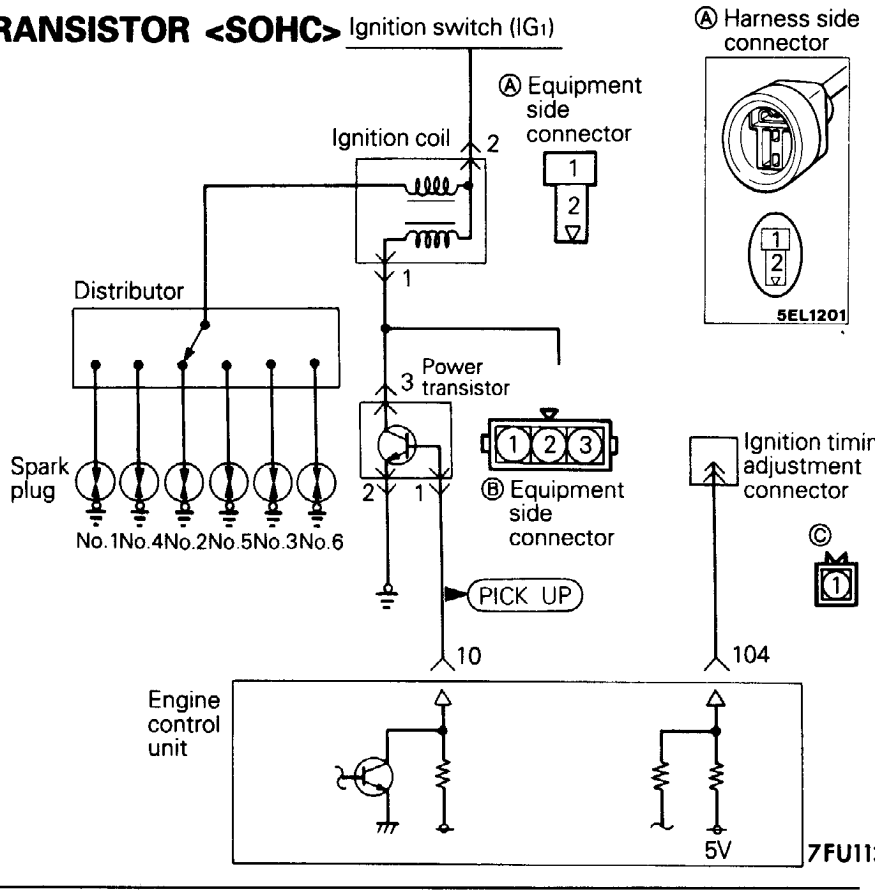
(3) Connect the special tool (test harness) to the idle speed control servo connector.
(4) Connect the positive (+) terminal of a power supply (approx. 6 V) to the white clip and the green clip.

(5) With the idle speed control servo as shown in the illustration, connect the negative (–) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
   ① Connect the negative (–) terminal of the power supply to the red and black clip.
   ② Connect the negative (–) terminal of the power supply to the blue and black clip.
   ③ Connect the negative (–) terminal of the power supply to the blue and yellow clip.
   ④ Connect the negative (–) terminal of the power supply to the red and yellow clip.
   ⑤ Connect the negative (–) terminal of the power supply to the red and black clip.
   ⑥ Repeat the tests in sequence from (5) to (1).
(6) If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

IGNITION COIL AND POWER TRANSISTOR <SOHC>







OPERATION

- When the power transistor is turned ON by the signal from the engine control unit, primary current flows to the ignition coil, When the power transistor is turned OFF, primary current is shut off and a high voltage is induced in the secondary coil.
- When the engine control unit turns OFF the transistor in the unit, the battery voltage in the unit is applied to the power transistor unit to turn it ON. When the engine control unit turns ON the transistor in the unit, the power transistor unit is turned OFF.

INSPECTION

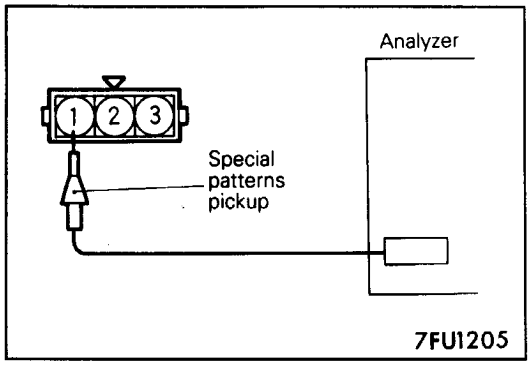
Using Multi-use Tester (MUT)

Ignition advance

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	• Engine: Warming up • Timing lamp: Set (set timing lamp to check actual ignition timing)	700 r/min. (Idle)	7–23°BTDC
				2,000 r/min.	20–40°BTDC

Ignition timing adjustment mode

Function	Item No.	Data display	Check condition	Engine state	Normal display
Data reading	36	Existence of continuity to earth of ignition timing adjustment terminal	Engine: Idling	Earth ignition timing adjustment terminal.	ON
				Remove earth from ignition timing adjustment terminal.	OFF



Wave Pattern Inspection Using an Analyzer

- Ignition coil primary signal

Refer to GROUP 16 – Ignition System.

- Power transistor control signal

<Measurement method>

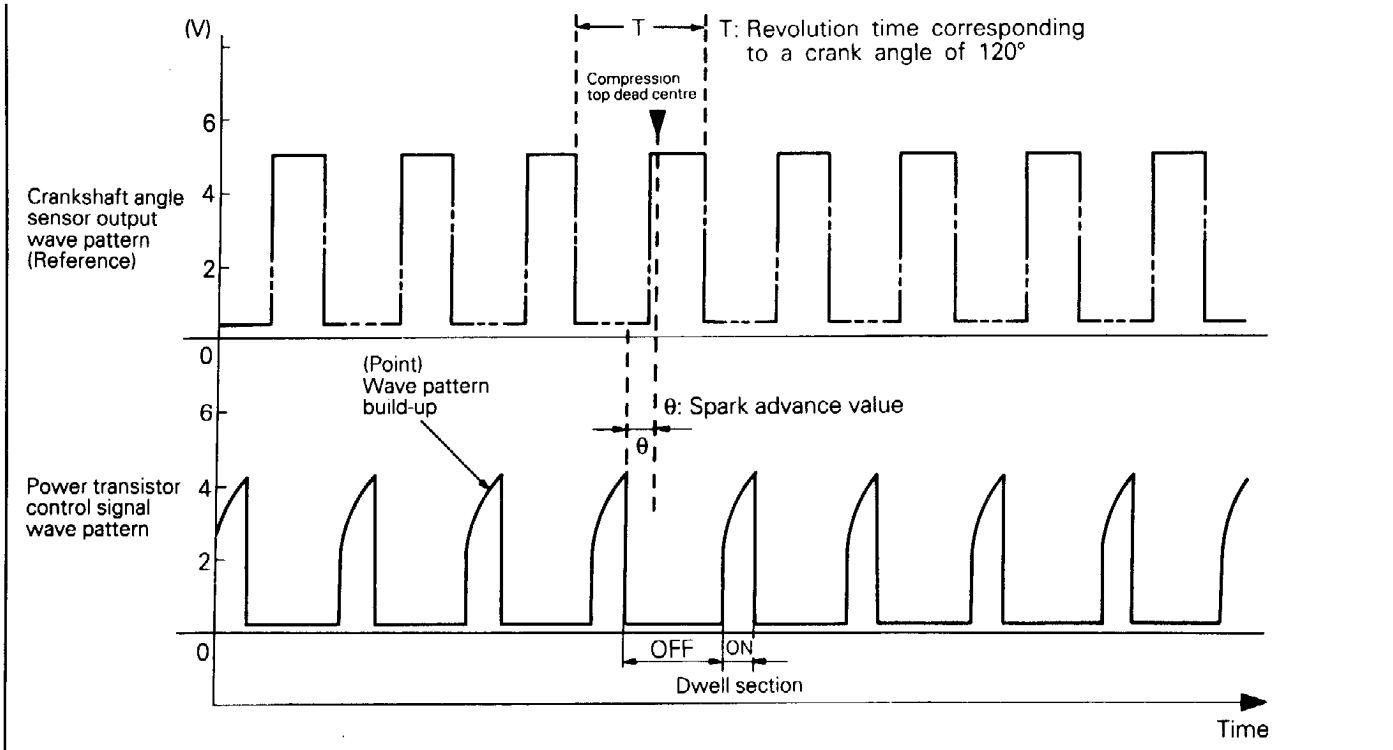
(1) Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)

(2) Connect the analyzer special patterns pickup to the power transistor connector terminal ③.

Standard wave pattern

Observation conditions

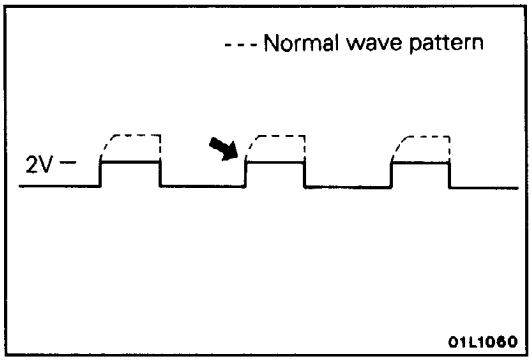
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine revolutions	Approx. 1200 r/min.



Wave pattern observation points

(Point): Condition of wave pattern build-up and maximum voltage (Tefer to abnormal wave pattern examples 1 and 2.)

Condition of wave pattern build-up and maximum voltage	Probable cause
Rise to the right to approximately 4.5V from around 2V.	Normal
Becomes a rectangular wave at approx. 2V	Broken wire in ignition primary circuit
Becomes a rectangular wave at power voltage	Malfunction of the power transistor



Examples of abnormal wave patterns

- Example 1

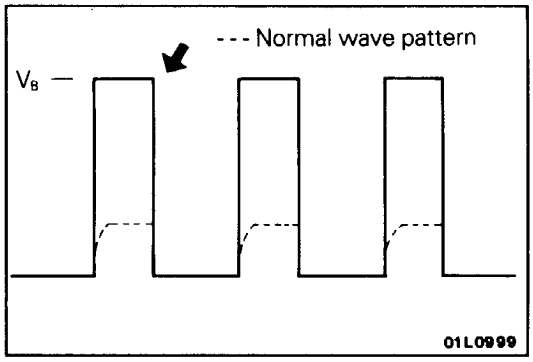
Wave pattern during engine cranking

Cause of problem

Broken wire in ignition primary circuit

Wave pattern characteristics

Top-right part of the build-up section cannot be seen, and voltage value is approximately 2V too low.



- Example 2

Wave pattern during engine cranking

Cause of problem

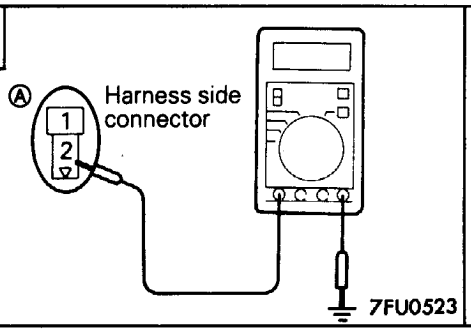
Malfunction in power transistor

Wave pattern characteristics

Power voltage results when the power transistor is ON.

HARNESS INSPECTION

1



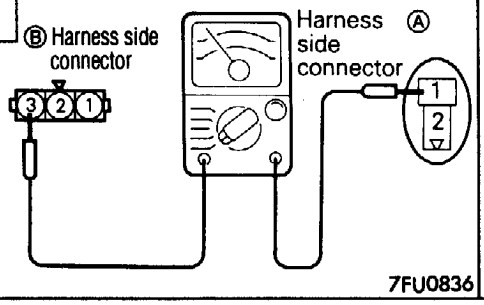
Measure the power supply voltage of the ignition coil.
- Connector: Disconnected
- Ignition Switch: ON

Voltage (V)
System voltage

OK → 2

OK → Repair the harness. (Ⓐ2–Ignition switch)

2

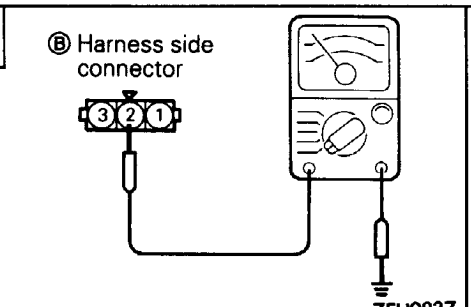


Check for an open-circuit, or a short-circuit to earth between the power transistor and the ignition coil.
- Ignition coil connector: Disconnected
- Power transistor connector: Disconnected

OK → 3

OK → Repair the harness. (Ⓐ1–Ⓑ3)

3

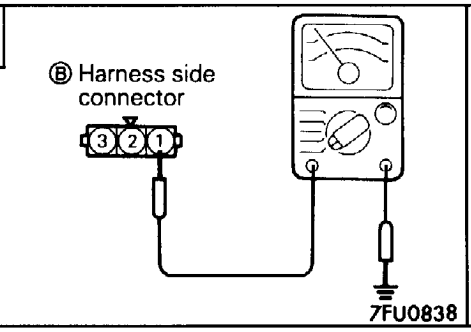


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 4

OK → Repair the harness. (Ⓑ2–Earth)

4



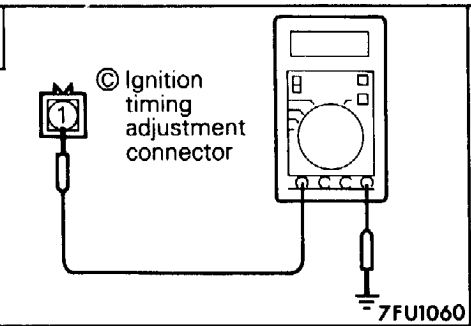
Measure the voltage of the control signal circuit of the power transistor.
- Connector: Disconnected
- Ignition switch: START

Voltage (V)
2–6

OK → 5

OK → Repair the harness. (Ⓑ1–10)

5



Measure the voltage of the ignition timing adjustment terminal.
- Ignition switch: ON

Voltage (V)
4.0–5.2

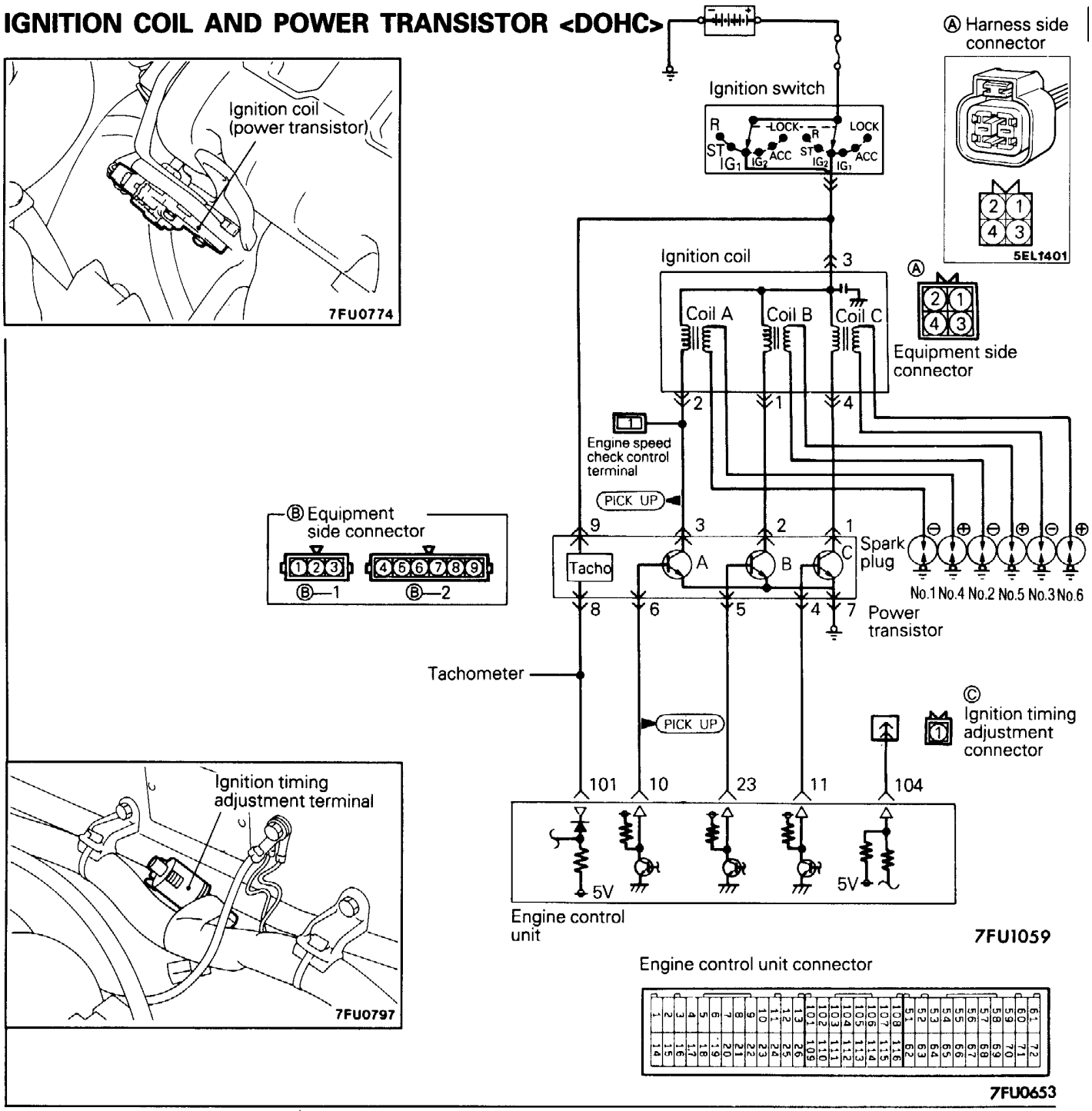
OK → STOP

OK → Repair the harness. (Ⓒ1–104)

ACTUATOR INSPECTION

Refer to GROUP 16 – Ignition System.

IGNITION COIL AND POWER TRANSISTOR <DOHC>



OPERATION

- When power transistor unit A is switched ON due to a signal from the engine control unit, primary current flows in ignition coil A. When power transistor unit A is switched OFF, primary current is cut off, and high voltage is generated in secondary coil A, thereby generating a spark at No. 1 and No. 4 cylinder spark plugs. On the other hand, when power transistor unit B is switched from ON to OFF, a spark is generated at the No. 2 and No. 5 cylinder spark plugs.
  Furthermore, when power transistor unit C switched from ON to OFF, a spark is generated at the No. 3 and No. 6 cylinder spark plugs.
- When the engine control unit turns the power transistor inside the unit OFF, battery voltage inside the unit is supplied to the power transistor unit and the power transistor unit is switched ON. Furthermore, when the engine control unit turns the power transistor inside the unit ON, the power transistor unit is switched OFF.

INSPECTION

Using Multi-use Tester (MUT)

Ignition advance

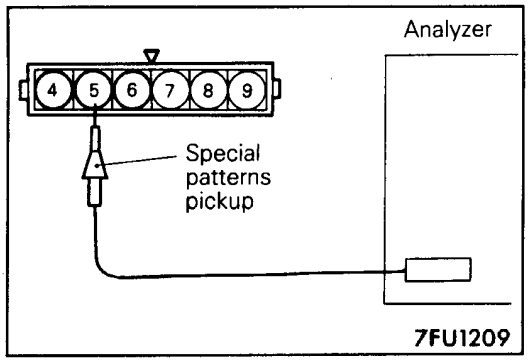
Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	• Engine: Warming up • Timing lamp: Set (set timing lamp to check actual ignition timing)	700 r/min. (Idle)	7–23° BTDC
				2,000 r/min.	24–45° BTDC

Ignition timing adjustment mode

Function	Item No.	Data display	Check condition	Engine state	Normal indication
Data reading	36	Existence of continuity to earth of ignition timing adjustment terminal	• Engine: Idling	Earth ignition timing adjustment terminal.	ON
				Remove earth from ignition timing adjustment terminal.	OFF

Standard ignition timing

Function	Item No.	Drive contents	Check condition	Normal condition
Actuator test	17	Set in ignition timing adjustment mode	• Engine: Idling • Timing light: set	Actual ignition timing: 5° BTDC ± 2°



Wave Pattern Inspection Using an Analyzer

- Ignition coil primary signal

Refer to GROUP 16 – Ignition System.

- Power transistor control signal.

<Measurement method>

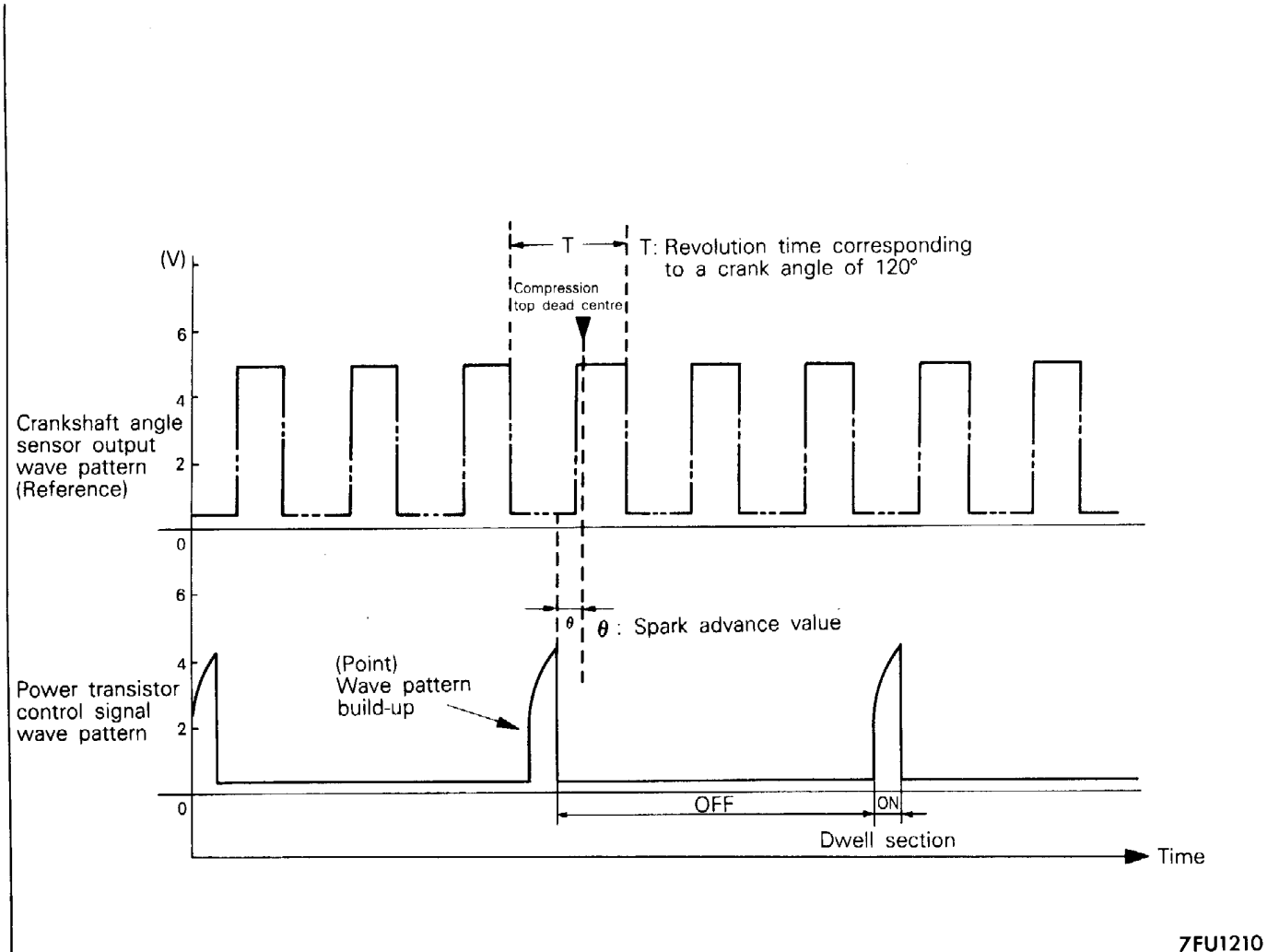
(1) Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)

(2) Connect the analyzer special patterns pickup to the connector terminals (4) (No.3 - No.6), (5) (No.2 - No.5) and (6) (No.1 - No.4) in that order.

Standard wave pattern

Observation conditions

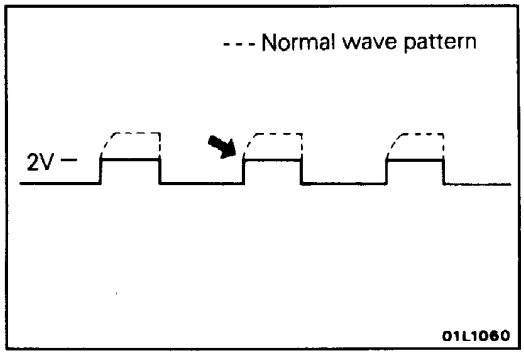
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine revolutions	Approx. 1200 r/min.



Wave pattern observation points

(Point): Condition of wave pattern build-up and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

Condition of wave pattern build-up and maximum voltage	Probable cause
Rise to the right to approximately 4.5V from around 2V.	Normal
Becomes a rectangular wave at approx. 2V	Broken wire in ignition primary circuit
Becomes a rectangular wave at power voltage	Malfunction of the power transistor



Examples of abnormal wave patterns

- Example 1

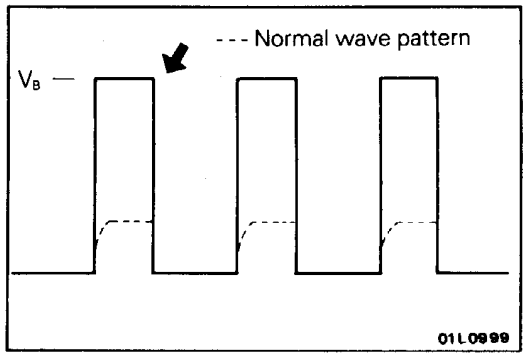
Wave pattern during engine cranking

Cause of problem

Broken wire in ignition primary circuit

Wave pattern characteristics

Top-right part of the build-up section cannot be seen, and voltage value is approximately 2V too low.



- Example 2

Wave pattern during engine cranking

Cause of problem

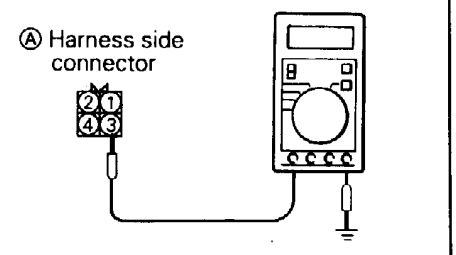
Malfunction in power transistor

Wave pattern characteristics

Power voltage results when the power transistor is ON.

HARNESS INSPECTION

1



Measure the ignition coil power supply voltage.

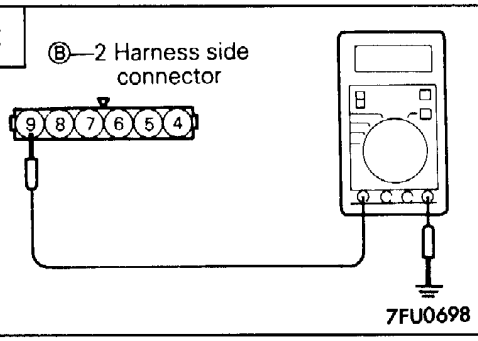
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

NG → Repair the harness. (Ⓐ3–Ignition switch)

2



Measure the power transistor unit power supply voltage.

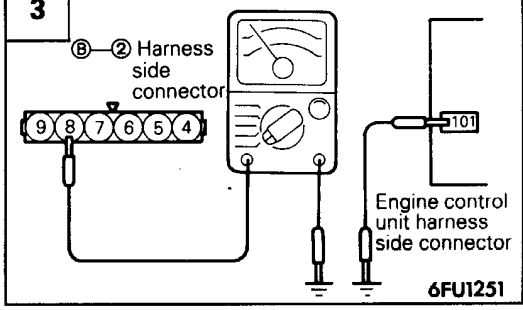
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 3

NG → Repair the harness. (Ⓑ9–Ignition switch)

3

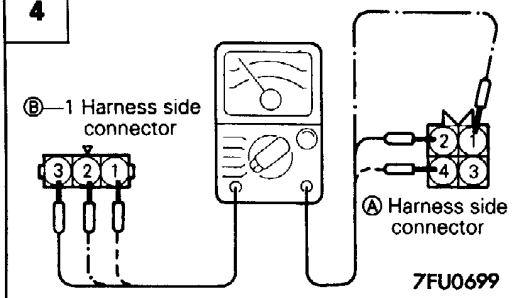


Check for an open circuit, or a short-circuit to earth between the power transistor and engine control unit.
- Power transistor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓑ8–101)

4

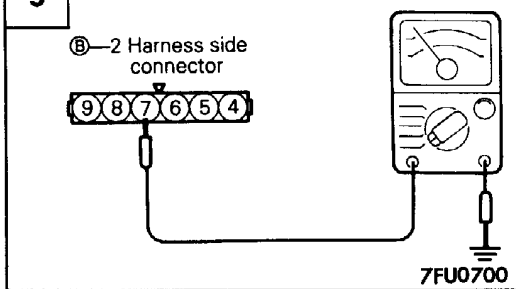


Check for an open circuit, or a short-circuit to earth between the power transistor and the ignition coil.
- Power transistor connector: Disconnected
- Ignition coil connector: Disconnected

OK → 5

NO → Repair the harness. (Ⓐ1–Ⓑ2) (Ⓐ2–Ⓑ3) (Ⓐ4–Ⓑ1)

5

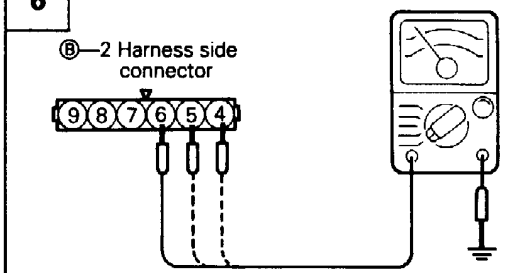


Check for continuity of the earth circuit of the power transistor.
- Connector: Disconnected

OK → 6

NO → Repair the harness. (Ⓑ7–Earth)

6



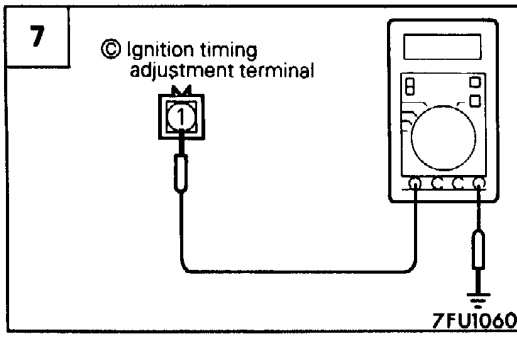
Measure the power transistor control signal voltage.
- Connector: Disconnected
- Ignition switch: START

Voltage (V)
0.5–4.0

OK → 7

NO → Repair the harness (Ⓑ6–10, Ⓑ5–23, Ⓑ4–11)

7



Measure the terminal voltage of the ignition timing adjustment terminal.
- Ignition switch: ON

Voltage (V)
4.0–5.2

OK → STOP

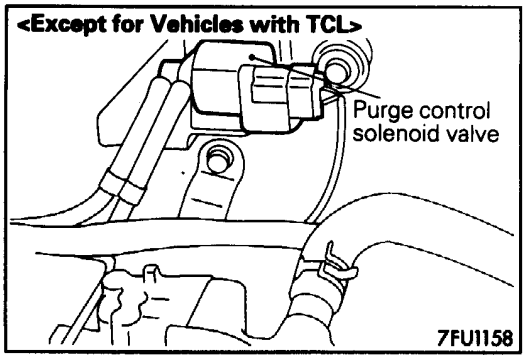
NO → Repair the harness. (©1–104)

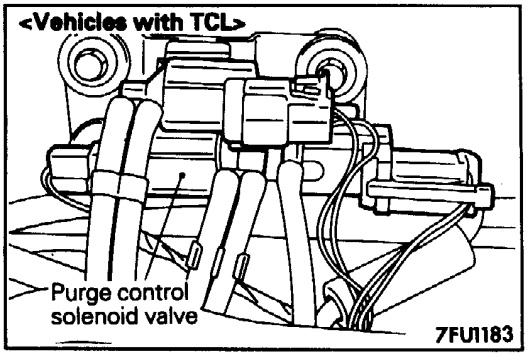
ACTUATOR INSPECTION

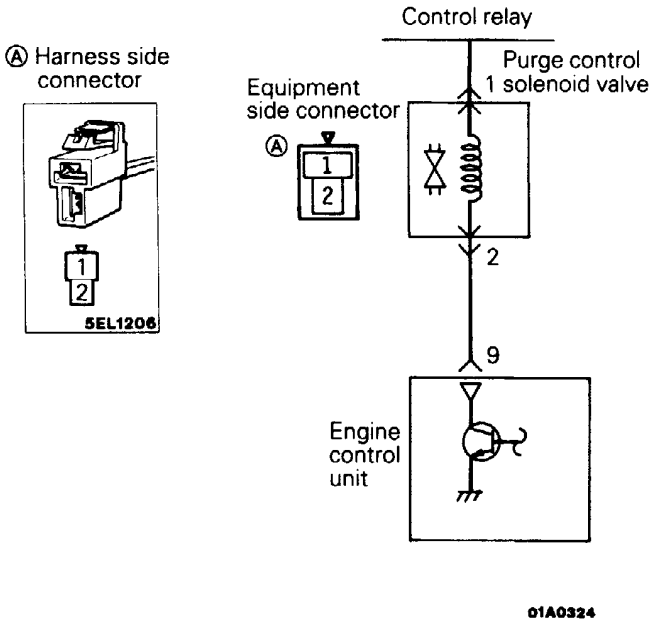
Refer to GROUP 16 – Ignition System.

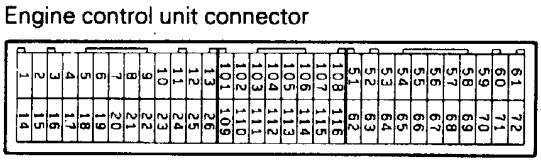
PURGE CONTROL SOLENOID VALVE

M13RCQA









OPERATION

- The purge-control solenoid valve is an ON/OFF type of solenoid valve; it functions to regulate the introduction of purge air from the canister to the intake air plenum.
- Battery power supply is supplied, by way of the control relay, to the purge-control solenoid valve.
  When the engine control unit switches ON the power transistor within the unit, current flows to the coil, and purge air is introduced.

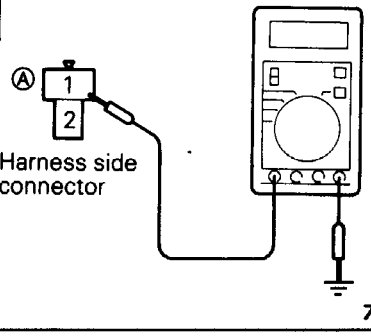
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Activation	Check condition	Normal condition
Actuator test	08	Solenoid valve is switched from OFF to ON.	• Ignition switch: ON	Operating sound is heard when driven.

HARNESS INSPECTION

1



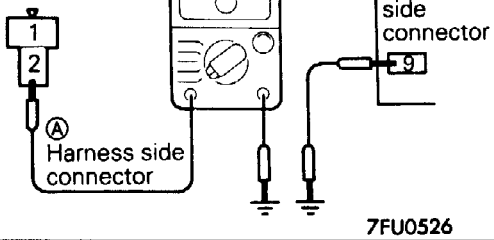
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

NG → Repair the harness. (Control relay–Ⓐ1)

2



Check for an open-circuit, or a short-circuit to ground, between the purge control solenoid valve and the engine control unit.
- Purge control solenoid valve connector: Disconnected
- Engine control unit connector: Disconnected

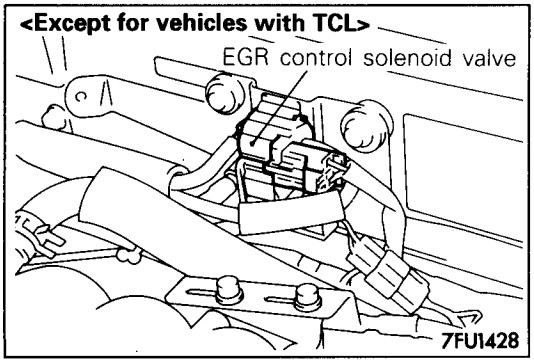
OK → STOP

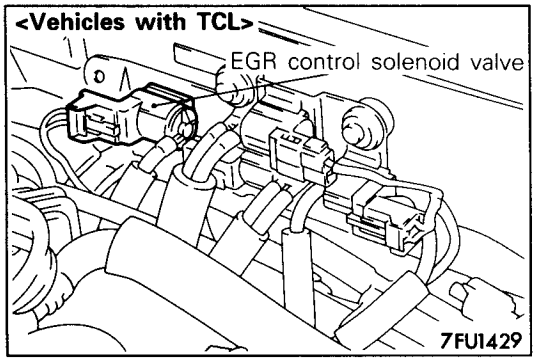
NG → Repair the harness. (Ⓐ2–9)

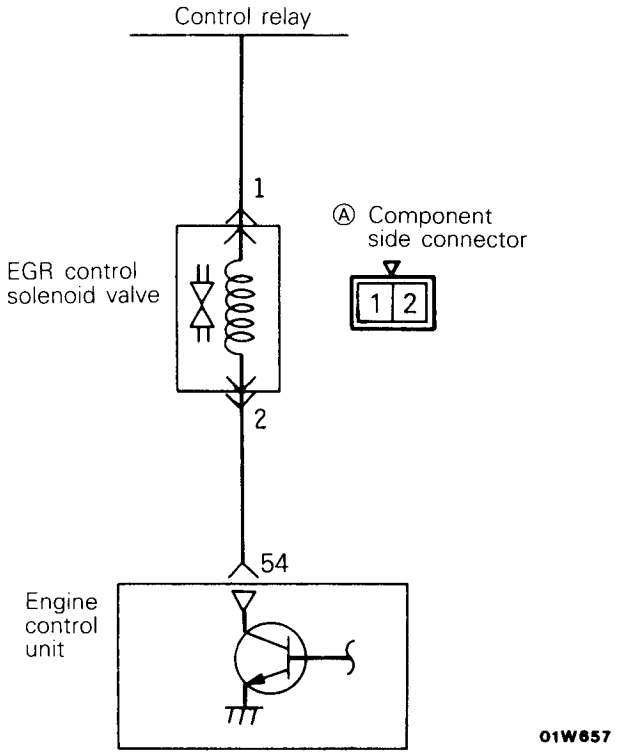
ACTUATOR INSPECTION

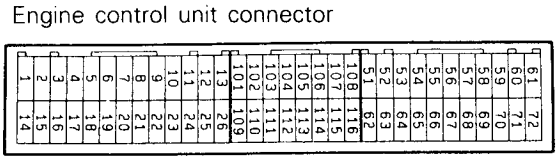
Refer to GROUP 17 – Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE <Vehicles built from December, 1992>









OPERATION

- The EGR control solenoid valve is a duty-control type of solenoid valve; it performs its control function by leaking the EGR valve-activation vacuum to the throttle body A port.
- Battery power supply is supplied, by way of the control relay, to the EGR control solenoid valve. When the engine control unit switches OFF the power transistor within the unit, current stops flowing to the coil, and the EGR valve-activation negative pressure leaks.

TROUBLESHOOTING HINTS

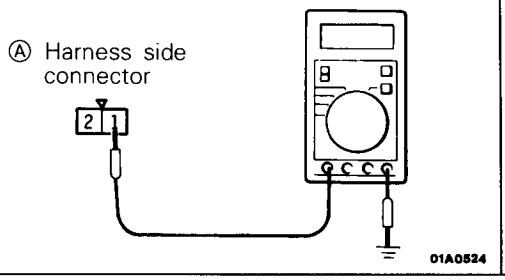
If the self-diagnosis code for EGR system malfunction is output even though the results of checking the EGR control solenoid valve harness and the component itself are normal, check the EGR valve, the vacuum hose piping, and the EGR passage for clogging.

INSPECTION
Using Multi-use tester (MUT)

Function	Item No.	Activation	Check conditions	Normal condition
Actuator test	10	Solenoid valve is switched from OFF to ON.	Ignition switch: ON	Operating sound is heard when driven.

HARNESS INSPECTION

1



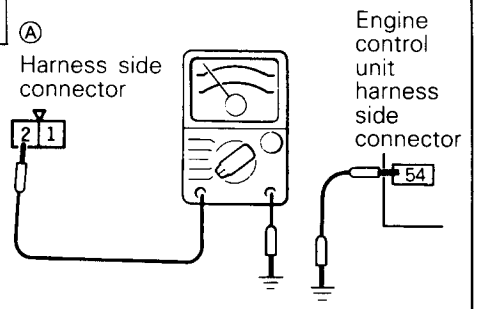
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

NO → Repair the harness. (Ⓐ1 – Control relay)

2



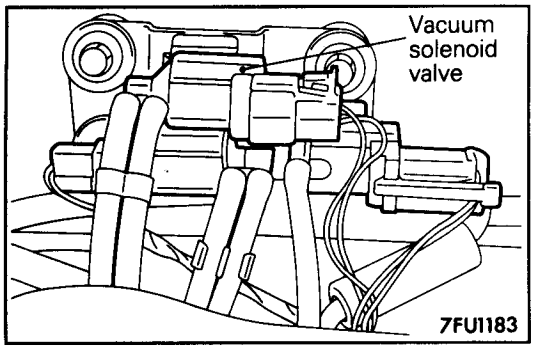
Check for an open-circuit, or a short-circuit to ground, between the EGR control solenoid valve and the engine control unit.
- EGR control solenoid valve connector: Disconnected
- Engine control unit connector: Disconnected

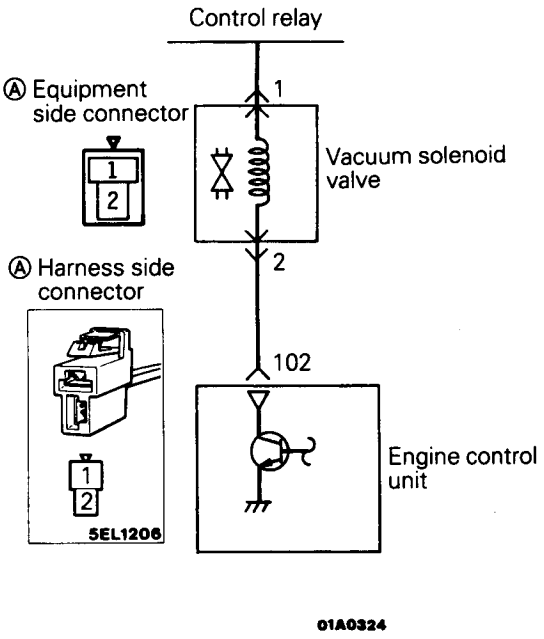
OK → STOP

NO → Repair the harness. (Ⓐ2 – 54)

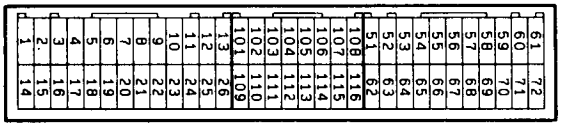
ACTUATOR INSPECTION
Refer to GROUP 17 – Evaporative Emission Control System.

VACUUM SOLENOID VALVE <Vehicles with TCL>





Engine control unit connector



7FU0653

OPERATION

- The vacuum solenoid valve is a duty control type of solenoid valve and controls the vacuum actuator operating vacuum.
- Battery voltage is supplied to the vacuum solenoid valve via the control relay.
  When the engine control unit turns on the power transistor inside the unit, current flows in the coil and vacuum from the vacuum tank is supplied to on the vacuum actuator.

TROUBLESHOOTING HINTS

Hint 1: When there is a short circuit in the vacuum solenoid valve circuit while the engine is running, intake manifold vacuum acts always on the vacuum actuator. As a result, the throttle valve does not function depending on the degree of accelerator opening but becomes fully closed and the engine speed does not increase from the idling speed.

Hint 2: If the engine speed does not increase above idling speed even if the accelerator pedal is depressed, remove the vacuum hose from the vacuum actuator. Then, if the engine speed rises in proportion to the pedal opening, it indicates the vacuum solenoid valve circuit is short circuited.

Hint 3: The engine control unit drives the vacuum solenoid valve once immediately after the ignition switch is turned ON. Consequently, the noise of the solenoid valve can be heard immediately after turning the ignition switch ON.

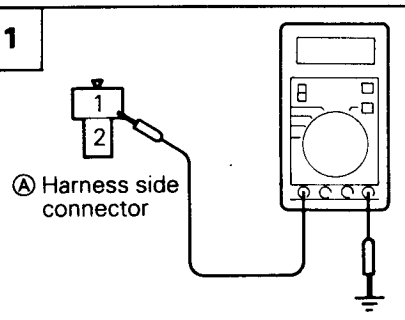
INSPECTION

Using Multi-use Tester (MUT)

Function	Item No.	Drive contents	Check condition	Normal condition
Actuator test	15	Solenoid valve is switched from OFF to ON.	• Ignition switch: ON	Operating noise is heard when driven

HARNESS INSPECTION

1



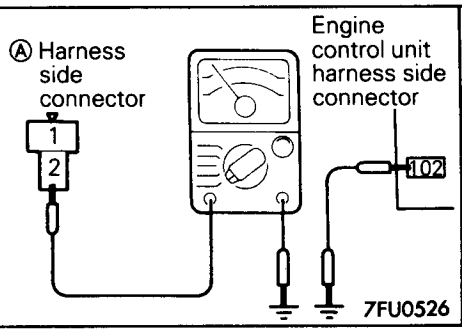
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

OK → Repair the harness (Ⓐ1–Control relay)

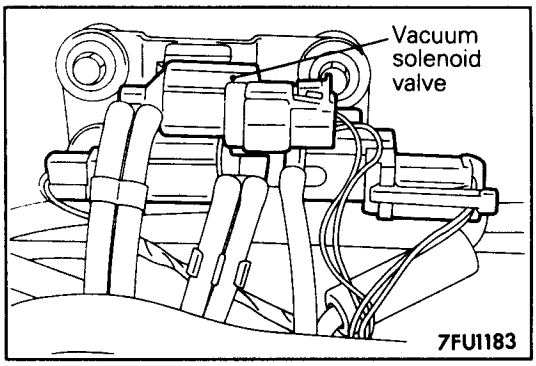
2



Check for an open-circuit, or a short circuit to earth between vacuum solenoid valve and the engine control unit.
- Vacuum solenoid valve connector: Disconnect
- Engine control unit connector: Disconnect

OK → STOP

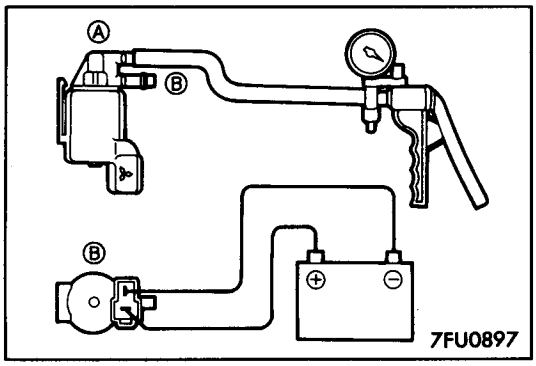
OK → Repair the harness (Ⓐ2–102)



ACTUATOR INSPECTION

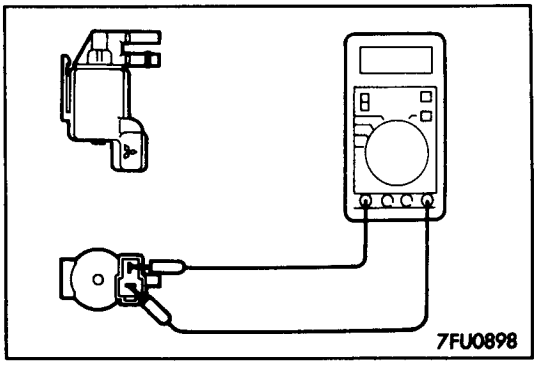
Inspection of operation of vacuum solenoid valve

(1) Remove the vacuum hose (blue stripe, green stripe) from the solenoid valve.
(2) Disconnect the harness connector.



(3) Connect a hand vacuum pump to solenoid valve Ⓐ nipple.
(4) Use jumper wires to connect the valve terminals and battery terminals.
(5) Connect intermittently the jumper wire to the battery (–) terminal, apply vacuum and inspect air-tightness.

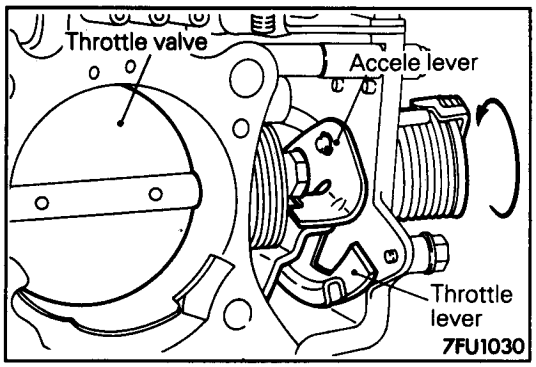
Jumper wire	Ⓑ nipple condition	Normal condition
Connect	Open	Vacuum is not held.
	Closed	Vacuum is held.
Disconnect	Open	Vacuum is held.



Inspection of coil resistance of vacuum solenoid valve

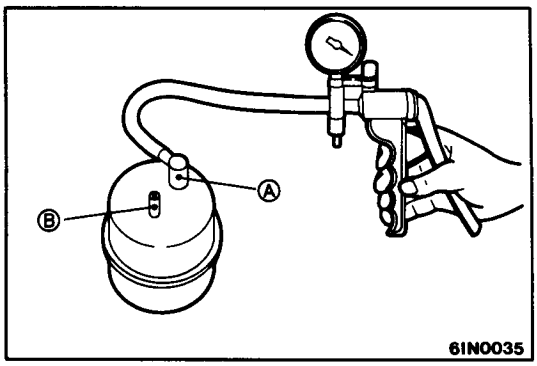
(1) Measure the resistance between the vacuum solenoid valve terminals.

Standard value: 36–44 Ω [at 20° (68°F)]



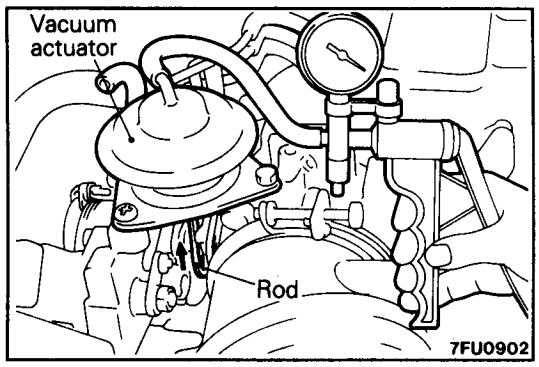
Inspection of throttle valve operation

(1) Check that the throttle valve opens and closes smoothly (throttle lever moves) according to the opening and closing of the accelerator lever.
(2) If the throttle valve does not open and close smoothly, there might be a deposit on the throttle valve, so clean the throttle body. (Refer to page 13-43.)



Vacuum tank inspection

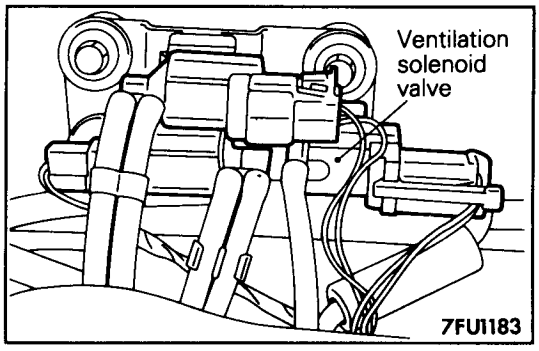
(1) Connect a hand vacuum pump to vacuum tank Ⓐ nipple, apply 500 mmHg (20 in. Hg) of vacuum and check that the vacuum is held.
(2) Connect a hand vacuum pump to vacuum tank Ⓑ nipple.
(3) First, close Ⓐ nipple with your finger and apply 500 mmHg (20 in. Hg) of vacuum. Then, check that the vacuum leaks immediately when you remove the finger blocking the nipple.

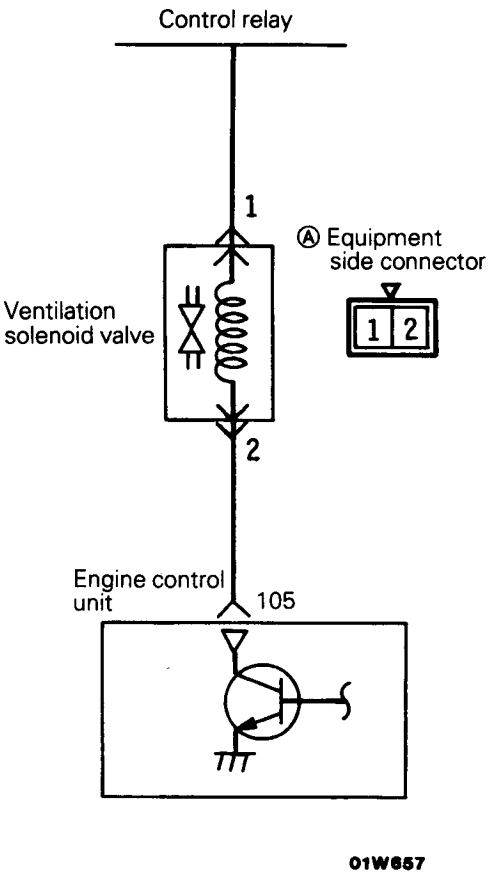


Vacuum actuator Inspection

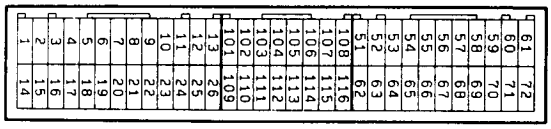
(1) Remove the vacuum hose (green stripe) from the vacuum actuator and connect a hand vacuum pump to the vacuum actuator.
(2) With the accelerator pedal depressed, check that the rod is pulled up and that vacuum is held when 200 mmHg (8 in. Hg) of vacuum is applied.

VENTILATION SOLENOID VALVE <Vehicles with TCL>





Engine control unit connector



7FU0653

OPERATION

- The ventilation solenoid valve is a duty control type of solenoid valve and controls the vacuum actuator operating vacuum by equalizing the pressure to the throttle body port A.
- Battery power is supplied to the ventilation solenoid vale via the control relay. When the engine control unit turns the power transistor inside the unit OFF, current stops flowing to the coil and the vacuum actuator operating vacuum is not held.

TROUBLESHOOTING HINT

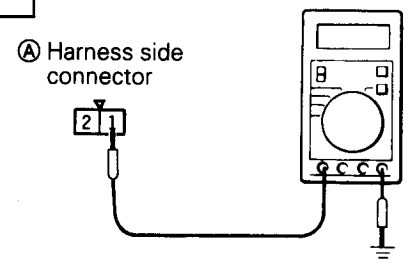
The engine control unit drives the vacuum solenoid valve once the ignition switch is turned ON. Consequently, the operating noise of the ventilation solenoid valve can be heard immediately after the ignition switch is turned ON.

INSPECTION
Using Multi-use Tester (MUT)

Function	Item No.	Drive contents	Check condition	Normal condition
Actuator test	16	Solenoid valve is switched from OFF to ON.	• Ignition switch: ON	Operating noise is heard when driven

HARNESS INSPECTION

1



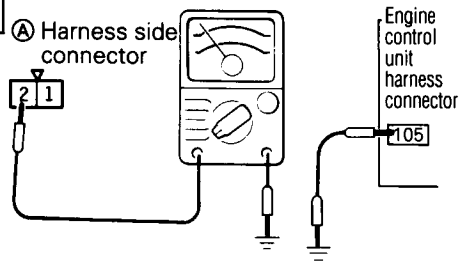
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
System voltage

OK → 2

OK → Repair the harness (Ⓐ1–Control relay)

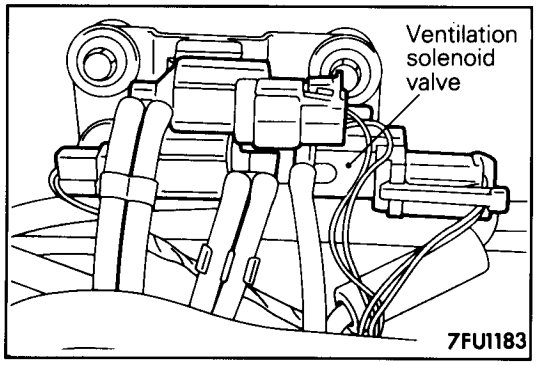
2



Check for an open circuit or a short circuits to earth between the ventilation solenoid valve and the engine control unit
- Ventilation solenoid valve connector: Disconnect
- Engine control unit connector: Disconnect

OK → STOP

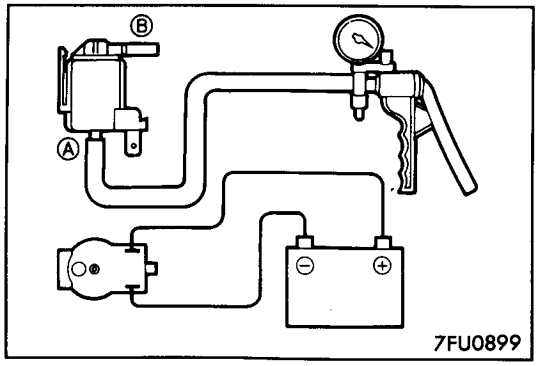
OK → Repair the harness (Ⓐ2–105)



ACTUATOR INSPECTION <Vehicles built up to November, 1991>

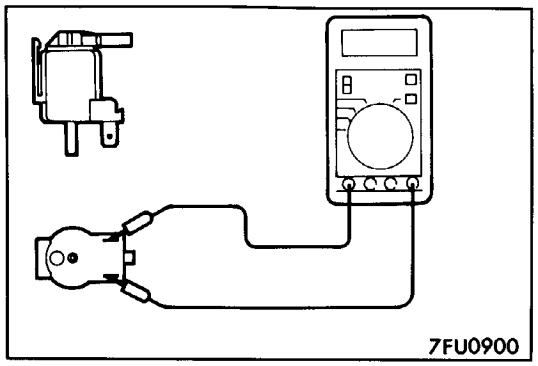
Inspection of ventilation solenoid valve operation

(1) Remove the vacuum hose (yellow stripe, green stripe) from the solenoid valve.
(2) Disconnect the harness connector.



(3) Connect a hand vacuum pump to the solenoid valve Ⓐ nipple.
(4) Use jumper wires to connect the solenoid valve terminals and the battery terminals.
(5) Connect intermittently the jumper wire to the battery (–) terminal, apply vacuum and check for air-tightness.

Jumper wire	Ⓑ Nipple condition	Normal condition
Disconnect	Open	Vacuum is not held.
	Closed	Vacuum is held.
Connect	Open	Vacuum is held.



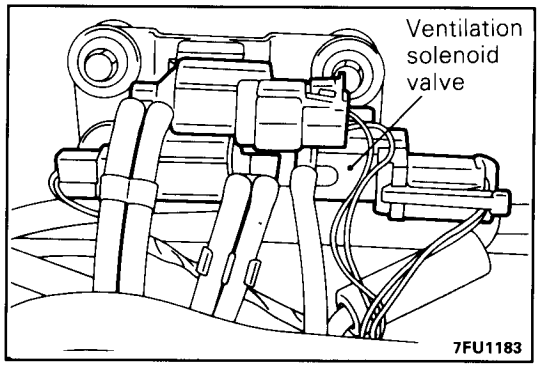
Inspection of ventilation solenoid valve coil resistance

(1) Measure the resistance between the solenoid valve terminals.

Standard value: 36–44 Ω [at 20° (68°F)]

Inspection of vacuum actuator

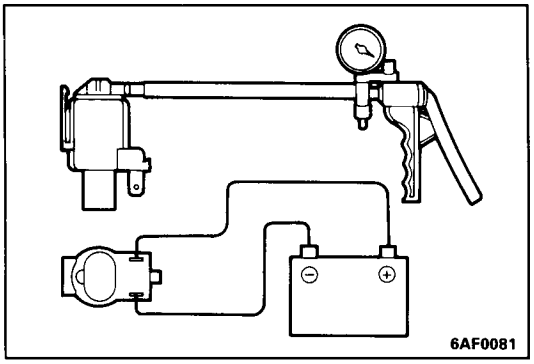
Refer to the vacuum solenoid valve (page 13-129).



ACTUATOR INSPECTION <Vehicles built from December, 1991>

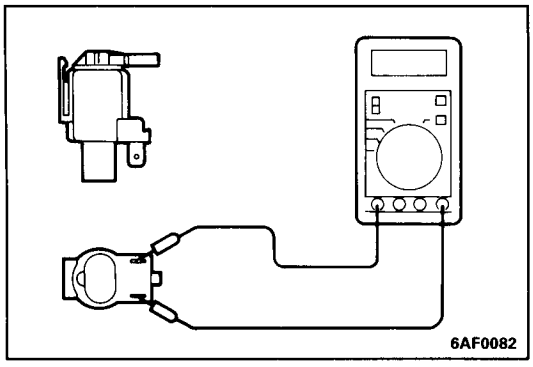
Inspection of ventilation solenoid valve operation

(1) Remove the vacuum hose (green stripe) from the solenoid valve.
(2) Disconnect the harness connector.



(3) Connect a hand vacuum pump to the solenoid valve nipple.
(4) Use jumper wires to connect the solenoid valve terminals and the battery terminals.
(5) Connect intermittently the jumper wire to the battery (–) terminal, apply vacuum and check for air-tightness.

Jumper wire	Normal condition
Disconnect	Vacuum is not held.
Connect	Vacuum is held.



Inspection of ventilation solenoid valve coil resistance

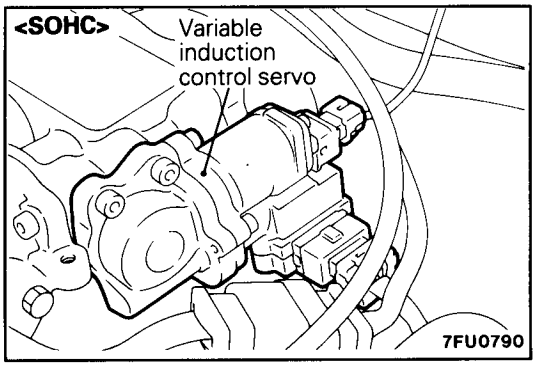
(1) Measure the resistance between the solenoid valve terminals.

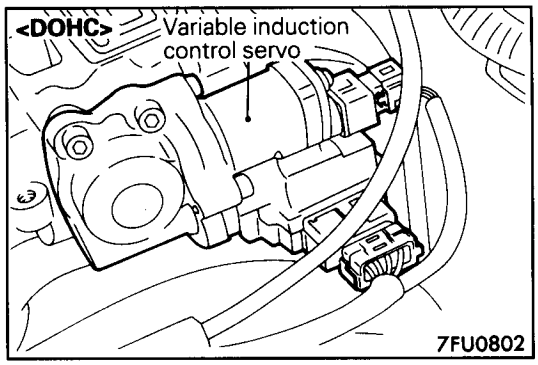
Standard value: 36–44 Ω [at 20° (68°F)

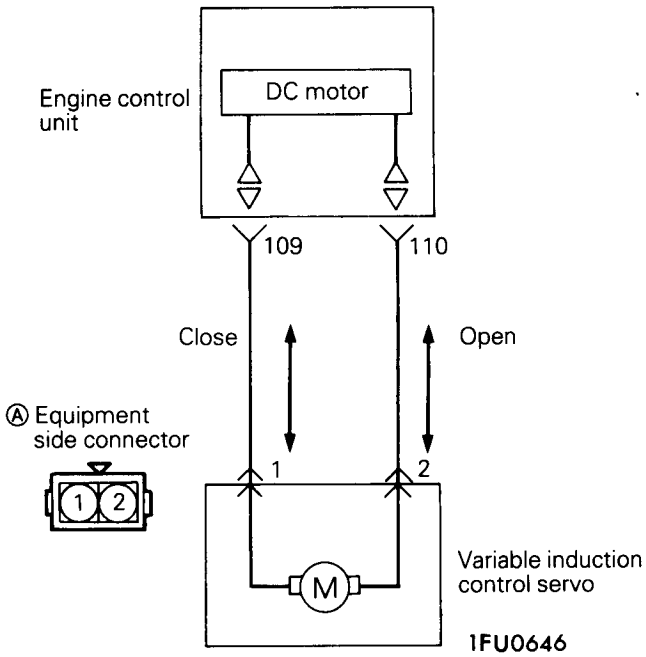
Inspection of vacuum actuator

Refer to the vacuum solenoid valve (page 13-129).

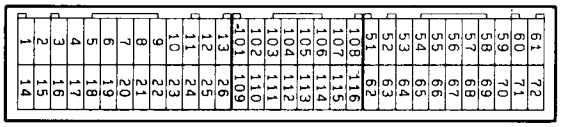
VARIABLE INDUCTION CONTROL SERVO







Engine control unit connector



7FU0653

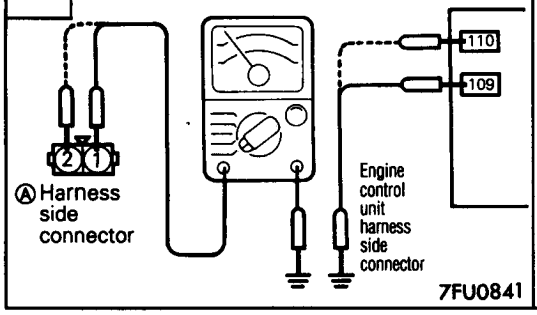
OPERATION

- The variable induction valve is opened and closed by driving the DC motor clockwise or anticlockwise according to the signal from the engine control unit.
- The DC motor is driven clockwise or anticlockwise according to the change in the direction of current in the motor drive IC in the engine control unit.

INSPECTION
Using Multi-use Tester (MUT)

Function	Item No.	Drive contents	Check condition	Normal condition
Actuator test	11	Drive the variable induction control (VIC) servo. (Opens and closes the variable induction valve.)	• Ignition switch: ON	The variable induction valve shaft turns. (Variable induction valve: Fully closed → fully open) <Vehicles built up to November, 1991> Operating sound is heard while driving <Vehicles built from December, 1991>

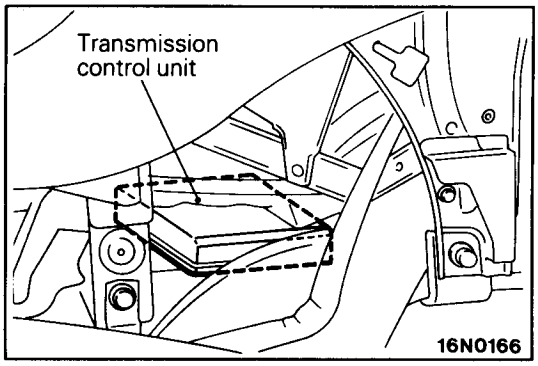
HARNESS INSPECTION

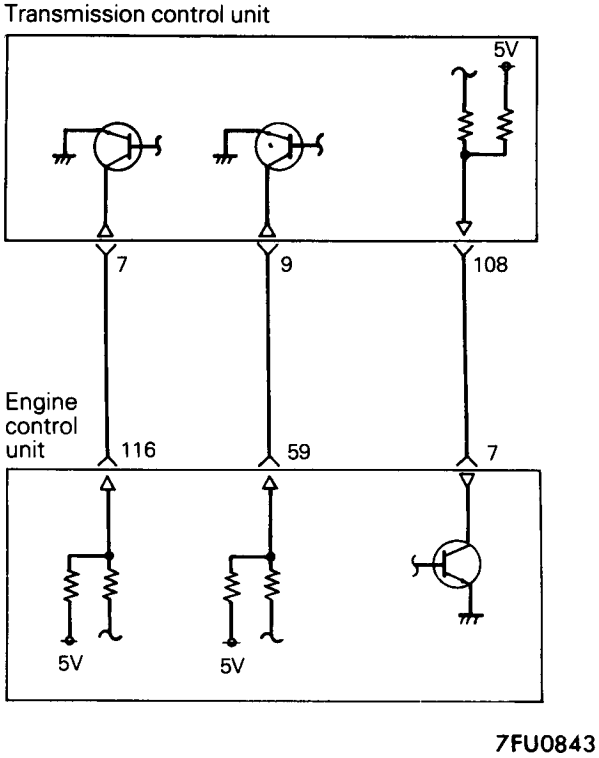
1 	Check for an open circuit or a short circuit to earth between the variable induction control (VIC) servo and the engine control unit. • Variable induction control (VIC) servo connector: Disconnect • Engine control unit connector: Disconnect	OK →	STOP
		OK →	Repair the harness. (Ⓐ 1 – 109, Ⓐ 2 – 110)

ACTUATOR INSPECTION

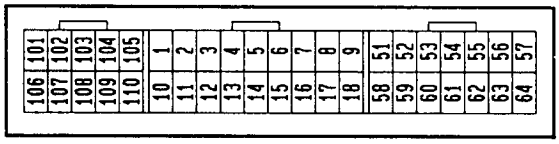
Refer to GROUP 15 – Service Adjustment Procedures.

ENGINE/TRANSMISSION OVERALL CONTROL SIGNAL <DOHC-A/T>

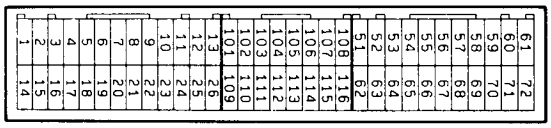




Ⓐ Transmission control unit connector



Engine control unit connector



OPERATION

Information is passed between the engine control unit and the transmission control unit by three communication lines for overall control of the engine and transmission.

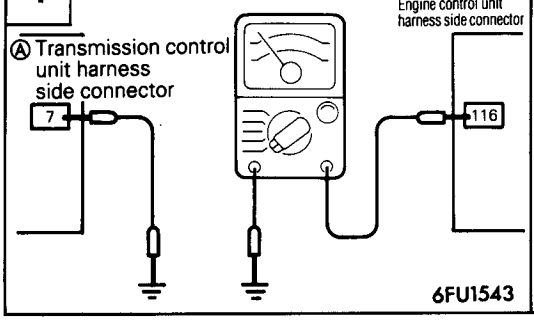
When the transistor inside the engine control unit is switched from OFF to ON by a control signal from the engine control unit, the terminal at which 5V is supplied from the transmission control unit is earthed inside the engine control unit. As a result, voltage on the transmission control unit terminal changes from HIGH to LOW. Furthermore, when the transistor inside the engine control unit is switched from ON to OFF, the terminal with released 5V from the transmission control unit which is earthed inside the engine control unit is opened and the voltage at the transmission control unit terminal changes from LOW to HIGH.

In this way, voltage at the transmission control unit terminal is controlled according to the ON/OFF state of the transistor inside the engine control unit, and information is transmitted.

On the other hand, the transmission control unit also controls the voltage at the engine control unit terminal according to the ON/OFF state of the transistor inside the transmission control unit and transmits information. Consequently, the engine and transmission pass control information back and forth.

HARNESS INSPECTION

1

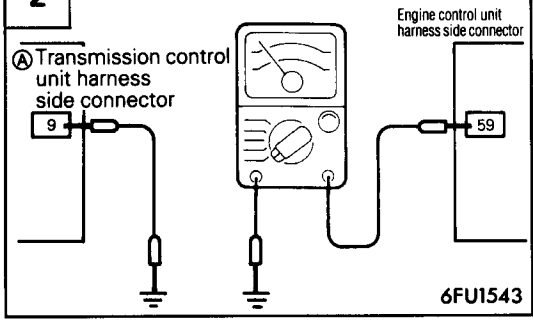


Check for an open circuit or a short circuit to earth between the transmission control unit and the engine control unit.
- Transmission control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → 2

NG → Repair the harness. (Ⓐ7–116)

2

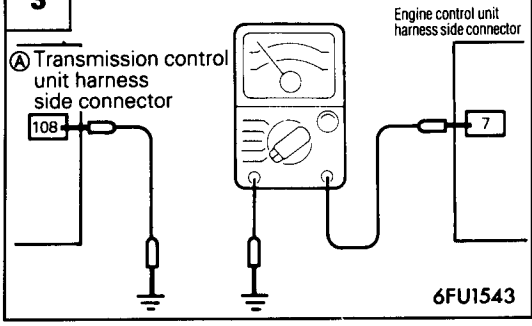


Check for an open circuit or a short circuit to earth between the transmission control unit and the engine control unit.
- Transmission control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → 3

NG → Repair the harness. (Ⓐ9–59)

3

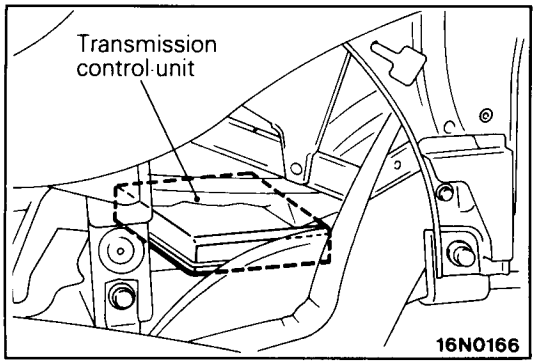


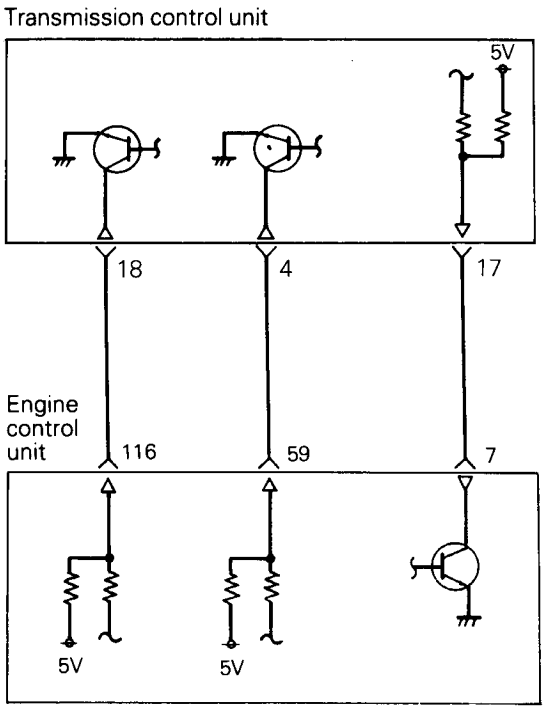
Check for an open circuit or a short circuit to earth between the transmission control unit and the engine control unit.
- Transmission control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → STOP

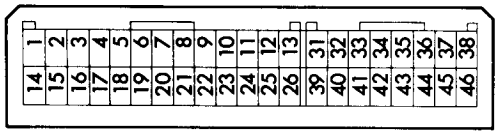
NG → Repair the harness. (Ⓐ108–7)

ENGINE/TRANSMISSION OVERALL CONTROL SIGNAL
<SOHC-A/T-Vehicles built from December, 1991>

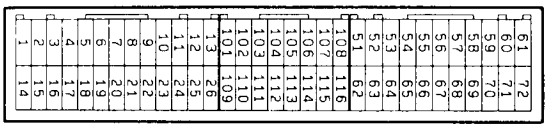




Ⓐ Transmission control unit connector



Engine control unit connector

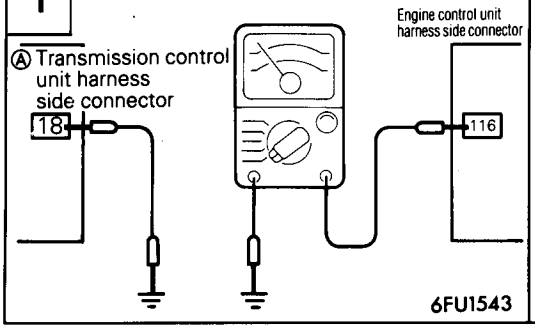


OPERATION

Refer to P.13-136

HARNESS INSPECTION

1

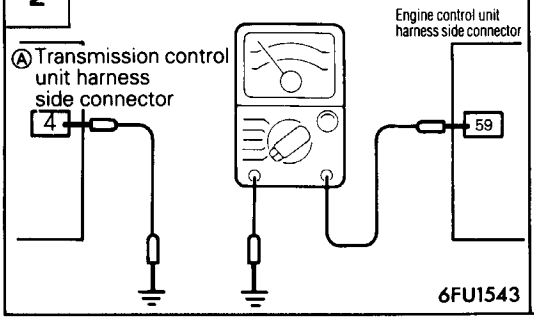


Check for an open circuit or a short circuit to earth between the transmission control unit and the engine control unit.
- Transmission control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → 2

NG → Repair the harness. (Ⓐ18–116)

2

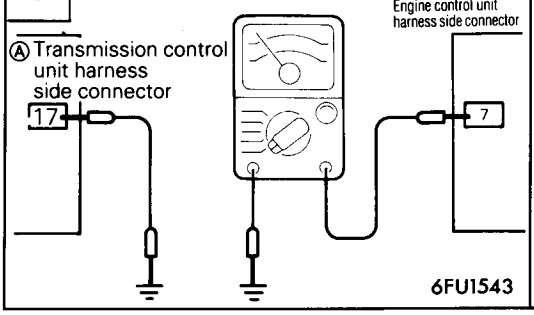


Check for an open circuit or a short circuit to earth between the transmission control unit and the engine control unit.
- Transmission control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → 3

NG → Repair the harness. (Ⓐ4–59)

3

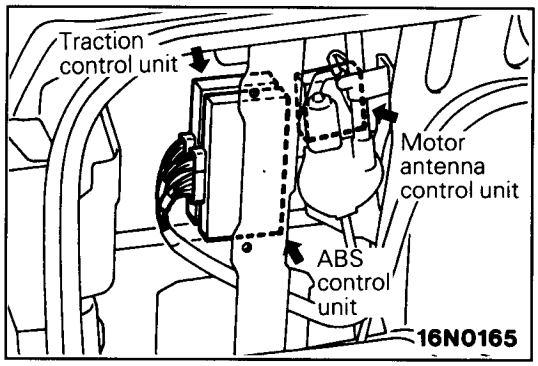


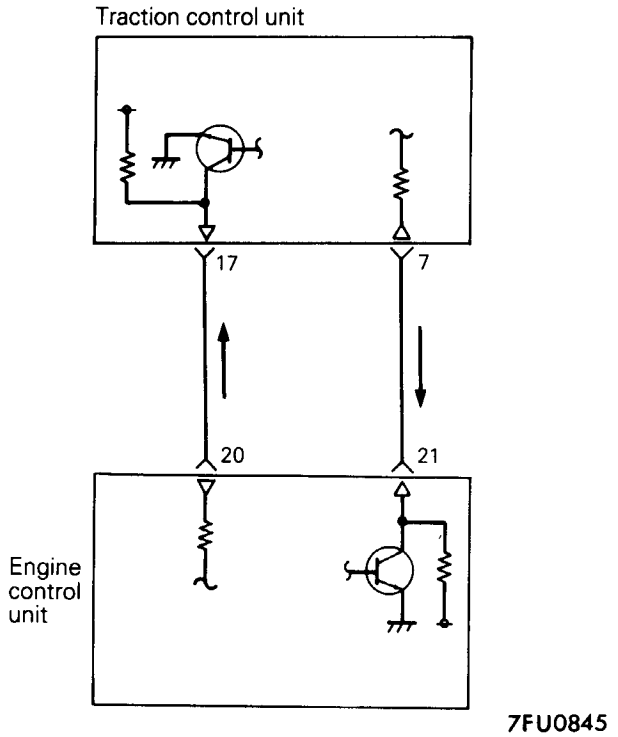
Check for an open circuit or a short circuit to earth between the transmission control unit and the engine control unit.
- Transmission control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → STOP

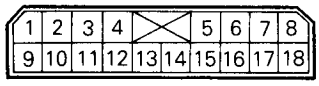
NG → Repair the harness. (Ⓐ17–7)

TRACTION CONTROL SIGNAL <Vehicles with TCL>



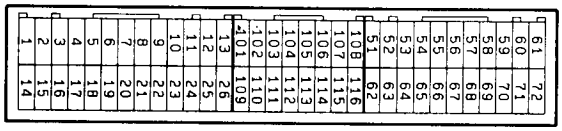


Ⓐ Traction control unit connector



7FU1191

Engine control unit connector

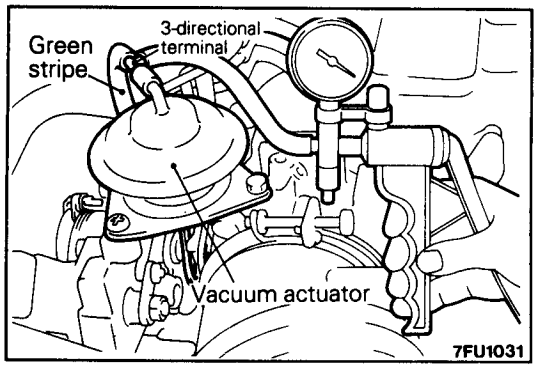


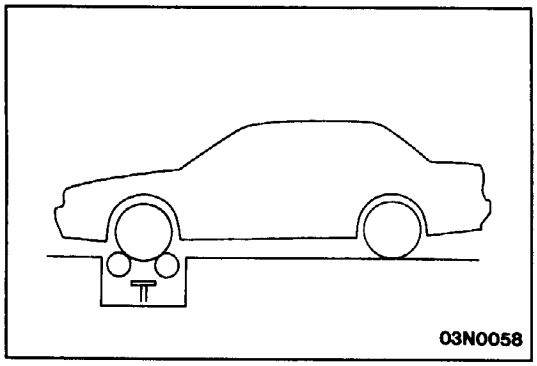
7FU0653

OPERATION

- Control information between the engine control unit and traction control unit is passed by mutual data communication.
- When the engine control unit turns the transistor inside the unit OFF, the voltage supplied to the traction control unit becomes HIGH. And when the engine control unit turns the power transistor inside the unit ON, the voltage supplied to the traction control unit becomes LOW. As a result, the engine control unit inputs data signals to the traction control unit by turning the transistor inside the unit ON ↔ OFF.

On the other hand, the traction control unit also inputs data signals to the engine control unit by turning the transistor inside the unit ON ↔ OFF.





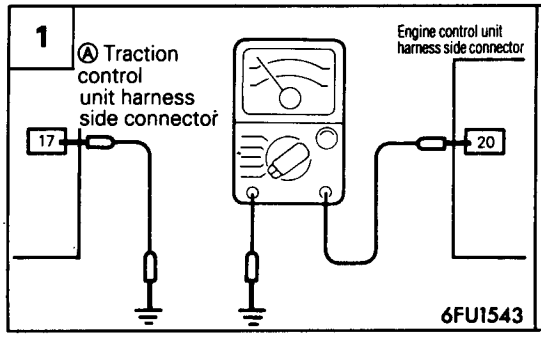
Inspection of traction control (TCL) operating vacuum

(1) Remove the vacuum hose (green stripe) from the vacuum actuator and connect a hand vacuum pump between the actuator nipple and vacuum hose via the 3-directional terminal.
Set the hand vacuum pump near the driver's seat so the vacuum check can be made from the driver's seat.
(2) Start the engine.
(3) Turn the TCL switch to the ON position.
(4) Set the selector lever in the D range and check the TCL operating vacuum when starting off.

Vehicle condition	Normal vacuum with accelerator pedal depressed
Speedometer tester on front wheel	150 mmHg (6 in. Hg) or more
On a dry paved road	No change

NOTE
1. With the front wheels mounted on a speedometer tester, the function of the TCL system should stop and the vacuum should decrease gradually 20 seconds or more after the accelerator pedal is depressed.
2. If the front wheels slip and there is a difference in the rotation of the front wheels and rear wheels, vacuum controlled by the TCL system is supplied to the vacuum actuator.

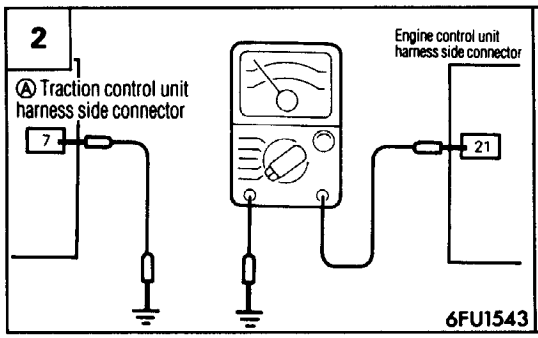
HARNESS INSPECTION



Check for an open circuit or a short circuit to earth between the traction control unit and the engine control unit.
- Traction control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → 2

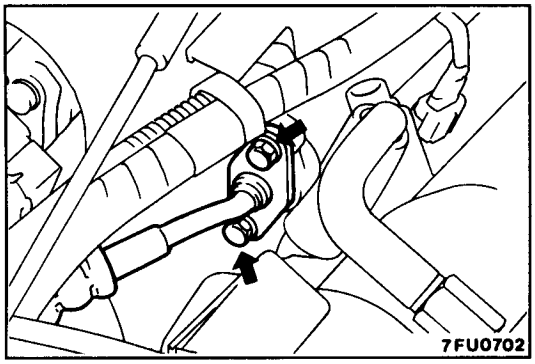
NG → Repair the harness. (Ⓐ17–20)



Check for an open circuit or a short circuit to earth between the traction control unit and the engine control unit.
- Traction control unit connector: Disconnect
- Engine control unit connector: Disconnect

OK → STOP

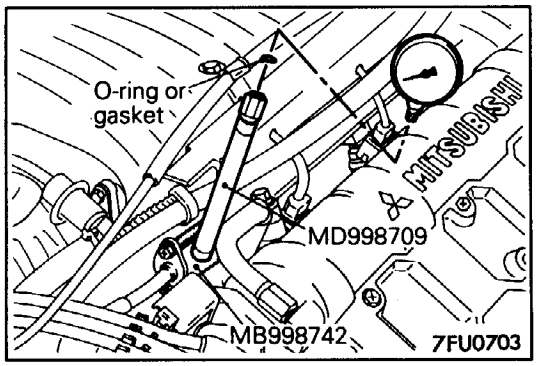
NG → Repair the harness. (Ⓐ7–21)



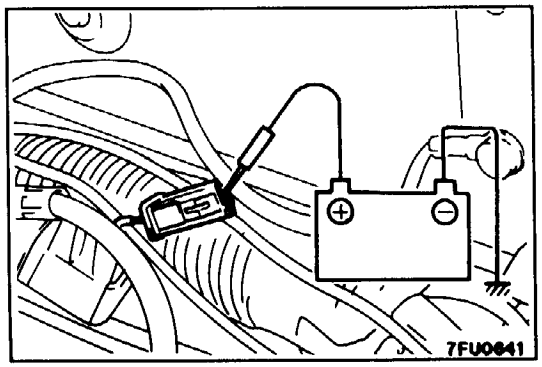
FUEL PRESSURE TEST

(1) Reduce the internal pressure of the fuel pipes and hoses. (Refer to P.13-51.)
(2) Disconnect the fuel high pressure hose at the delivery pipe side.

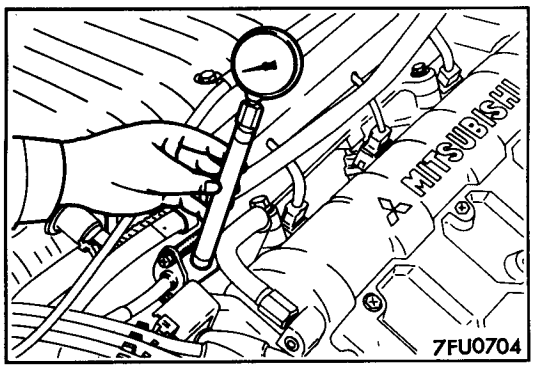
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



(3) Set a fuel pressure gauge on the special tool, placing adequate O-ring or gasket between the gauge end special tool prevent fuel leaks.
(4) Attach the special tool set in step (3) to the delivery pipe.
(5) Connect the (–) battery terminal.

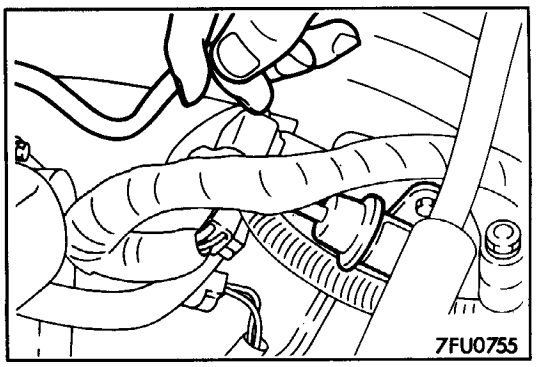


(6) Connect a jumper wire to the terminal (black) for activation of the fuel pump and to the positive (+) terminal of the battery to activate the fuel pump. With fuel pressure applied, check to be sure that there is no fuel leakage from the fuel pressure gauge and the special tool connection part.
(7) disconnect the jumper wire (from the terminal for activation of the fuel pump) to stop the fuel pump.
(8) Start the engine and let it idle.



(9) Measure the fuel pressure during idling.

Standard value: Approx. 270 kPa (2.7 kg/cm², 38 psi) at curb idle



(10) Disconnect the vacuum hose from the fuel pressure regulator, and then measure the fuel pressure while using finger to plug the end of the hose.

Standard value: 330–350 kPa (3.3–3.5 kg/cm², 47–50 psi) at curb idle speed

(11) Check to be sure that the fuel pressure during idling does not decrease even after the engine is raced a few times.

(12) Use a finger to gently press the fuel return hose while repeatedly racing the engine, and check to be sure that there is fuel pressure in the return hose also.

NOTE
There will be no fuel pressure in the return hose if there is insufficient fuel flow.

(13) If the fuel pressure measured in steps (9) to (12) deviates from the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
• Fuel pressure is too low. • Fuel pressure drops during racing. • No fuel pressure in fuel return hose.	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of the valve seat within the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
	Fuel pump low discharge pressure.	Replace the fuel pump.
Fuel pressure is too high.	The valve within the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.
No change of the fuel pressure when vacuum hose is connected and when not connected.	Damaged vacuum hose or nipple clogging.	Replace the vacuum hose, or clean the nipple.

(14) Stop the engine and check for a change of the value indicated by the fuel pressure gauge. The condition is normal if there is no decrease of the indicated value within two minutes.
If there is a decrease of the indicated value, monitor the speed of the decrease, and, referring to the table below, determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the engine is stopped, the fuel pressure drops graudally.	Injector leakage	Replace the injector.
	Leakage at the fuel pressure regulator valve seat	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the engine is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

(15) Remove all remaining pressure from inside the fuel pipe. (Refer to P.13-51.)
(16) Disconnect the fuel pressure gauge and the special tool from the delivery pipe.

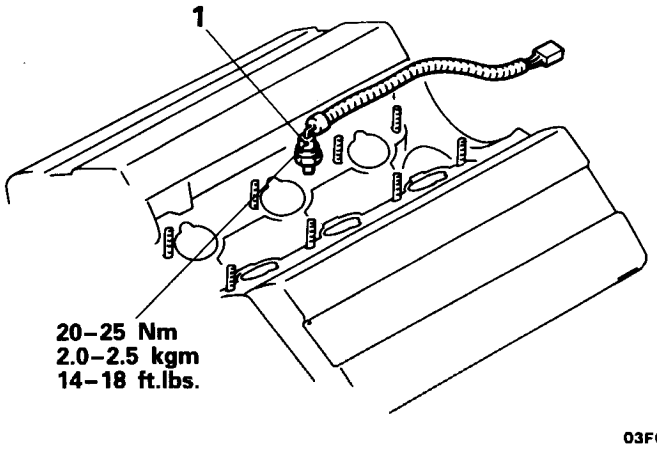
Caution
Because there will be a slight amount of remaining pressure in the fuel pipe line, use rags to cover so that fuel doesn't splatter.

(17) Replace the O-ring at the end of the fuel high-pressure hose with a new one.
(18) After connecting the fuel high-pressure hose to the delivery pipe, tighten the installation bolt.
(19) Check to be sure that there is no fuel leakage.
① Apply battery voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.
② With fuel pressure applied, check for leakage of the fuel line.

DETONATION SENSOR

E13YAAA

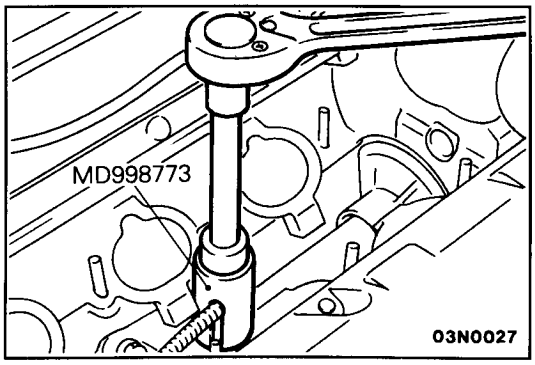
REMOVAL AND INSTALLATION



03F0021

Pre-removal and Post-installation Operation
- Removal and installation of air intake plenum.
- Removal and installation of intake manifold.

◆■► ►◆ 1. Detonation sensor



SERVICE POINTS OF REMOVAL

E13YBAA

1. REMOVAL OF DETONATION SENSOR

SERVICE POINTS OF INSTALLATION

E13YDAA

1. INSTALLATION OF DETONATION SENSOR

It should be tightened firmly to the specified torque, as there will be an effect on engine control.

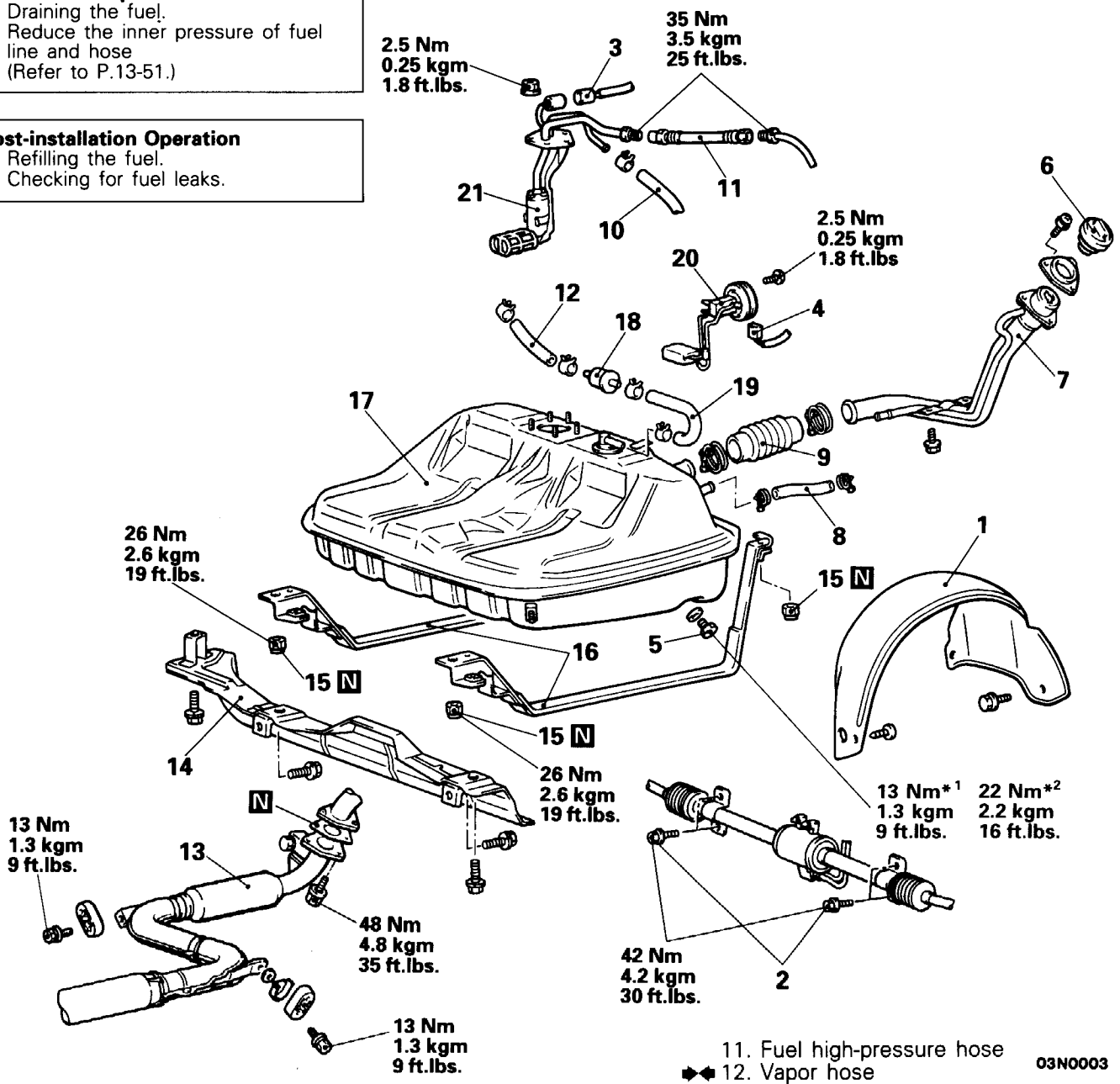
FUEL TANK

E13GA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining the fuel.
- Reduce the inner pressure of fuel line and hose (Refer to P.13-51.)

Post-installation Operation
- Refilling the fuel.
- Checking for fuel leaks.

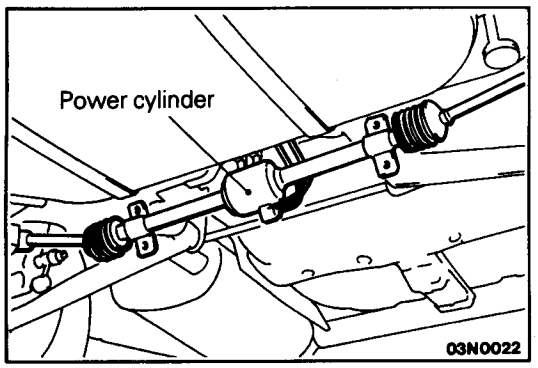


Removal steps

1. Liner <DOHC>
2. ⇔ Power cylinder attachment bolt <Vehicles with 4WS>
3. Fuel pump connector
4. Fuel gauge unit connector
5. Drain plug
6. Fuel tank cap
7. Filler neck
8. ◆◆ Vapor hose
9. ◆◆ Filler hose
10. ◆◆ Return hose
11. Fuel high-pressure hose
12. ◆◆ Vapor hose
13. ⇔ Center exhaust pipe
14. Fuel tank protector
15. ◆◆ Self-locking nut
16. Tank band
17. Fuel tank
18. ◆◆ Two-way valve
19. ◆◆ Vapor hose
20. Fuel gauge unit
21. Fuel pump unit

03N0003

NOTE
*1: Drain plug head mark "4T" <Vehicles built up to February, 1991>
*2: Drain plug head mark "7T" <Vehicles built from March, 1991>

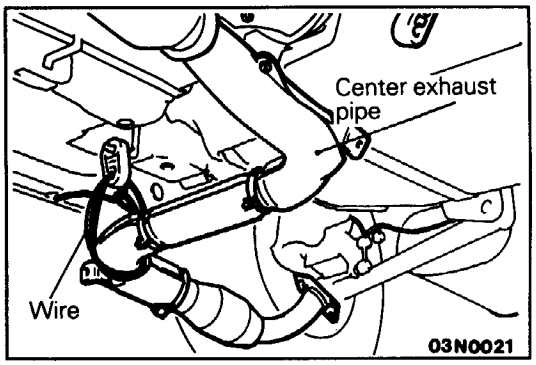


SERVICE POINTS OF REMOVAL E13GBAM

2. REMOVAL OF POWER CYLINDER ATTACHMENT BOLT <VEHICLES WITH 4WS>

Remove the 4WS rear wheel steering power cylinder attachment bolt, and lower the cylinder.

NOTE
Lowering the power cylinder provides working space.



13. REMOVAL OF CENTER EXHAUST PIPE

Remove the rubber hangers (2 places) and the bolt connecting the main muffler, and secure the center exhaust pipe with wire.

INSPECTION E13GCAL

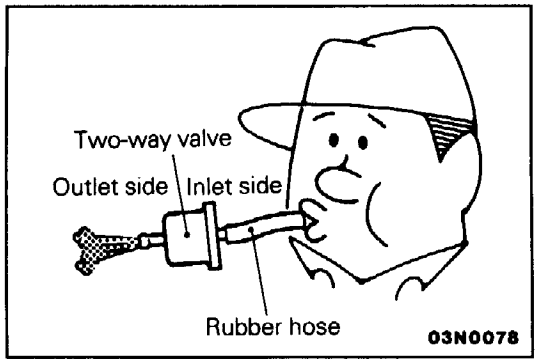
- Check the hoses and the pipes for crack or damage.
- Check the fuel tank cap for malfunction.
- Check the fuel tank for deformation, corrosion or crack.
- Check the fuel tank for dust or foreign material.

NOTE
If the inside of the fuel tank is to be cleaned, use any one of the following:

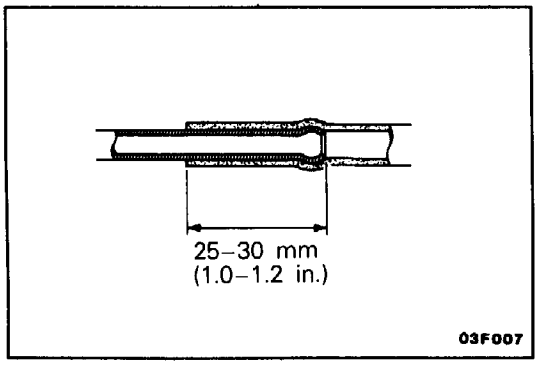
(1) Kerosene
(2) Trichloroethylene
(3) A neutral emulsion type detergent

SIMPLE CHECKING OF THE TWO-WAY VALVE

Attach a clean hose and check the operation of the two-way valve.



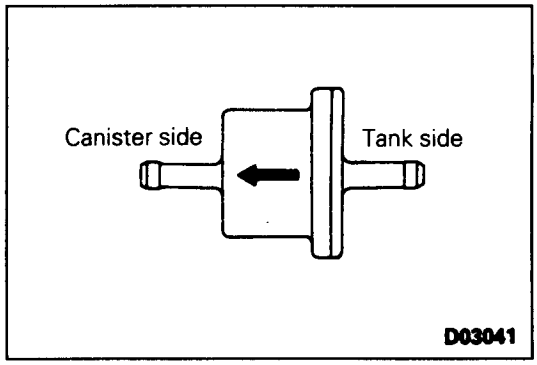
Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side (canister side).	Air passes through.



SERVICE POINTS OF INSTALLATION E13GDAY

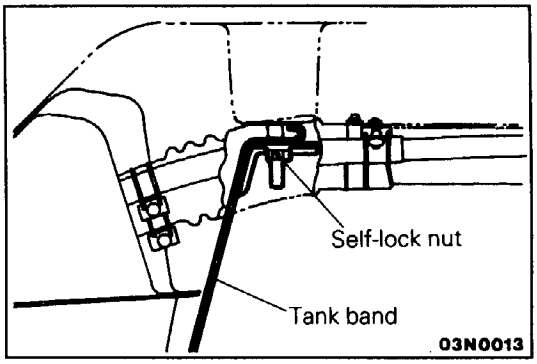
19. /12. INSTALLATION OF VAPOR HOSE/10. RETURN HOSE

If the pipe has a stepped part, connect securely up to the stepped part. If the pipe has no stepped part, insert so that the inserted portion is 25–30 mm (1.0–1.2 in.) long.



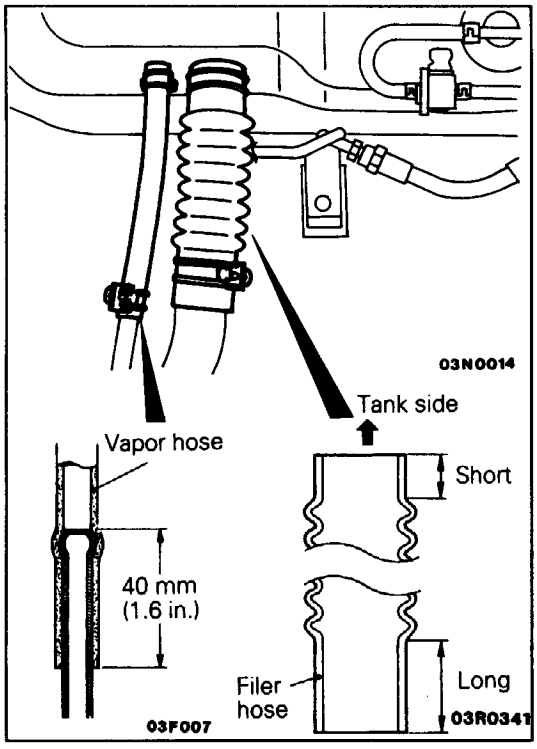
18. INSTALLATION OF TWO-WAY VALVE

Install so that the installation direction of the two-way valve is correct.



15. INSTALLATION OF SELF-LOCKING NUT (REAR)

Tighten the self-locking nut until the tank band touches the body.



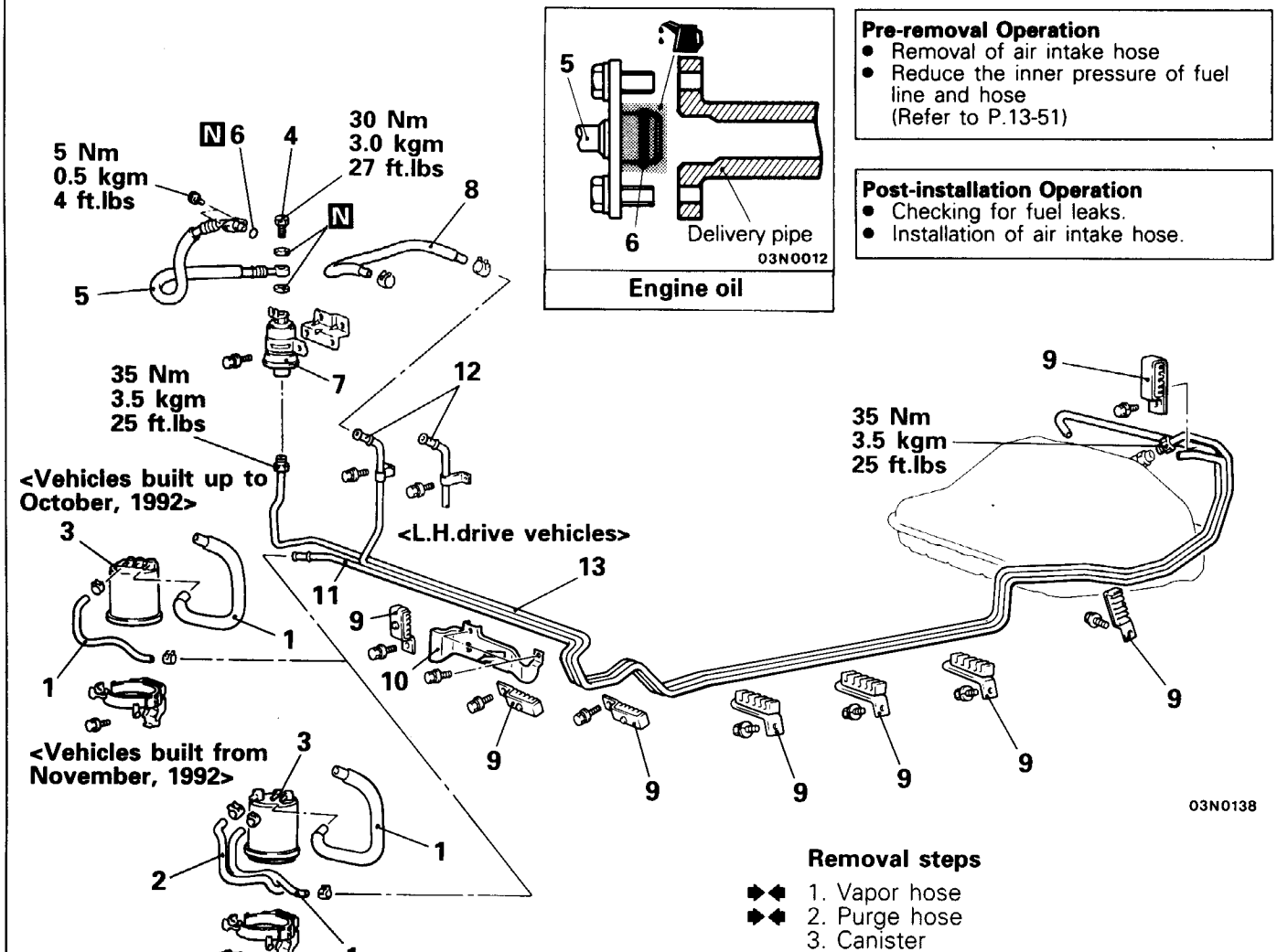
9. INSTALLATION OF FILLER HOSE/8. VAPOR HOSE

(1) Install the filler hose with the short connector piece towards the tank.
(2) Insert the vapor hose all the way to the tank side, and approx. 40 mm (1.6 in.) to the filler neck side.

FUEL LINE AND VAPOR LINE

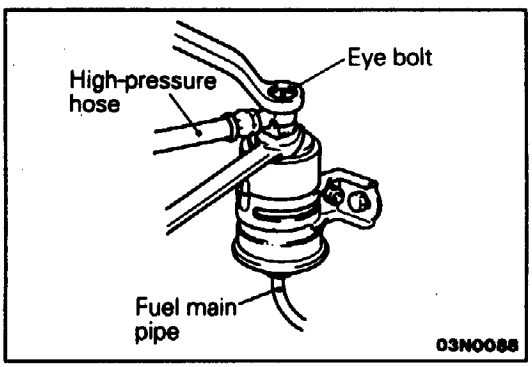
E13KA--

REMOVAL AND INSTALLATION



Removal steps

- 1. Vapor hose
- 2. Purge hose
- 3. Canister
- 4. Eye bolt
- 5. Fuel high pressure hose
- 6. O-ring
- 7. Fuel filter
- 8. Return hose
- 9. Clip
- 10. Protector <DOHC-L.H. drive vehicles>
- 11. Fuel vapor pipe
- 12. Fuel return pipe
- 13. Fuel main pipe



SERVICE POINTS OF REMOVAL

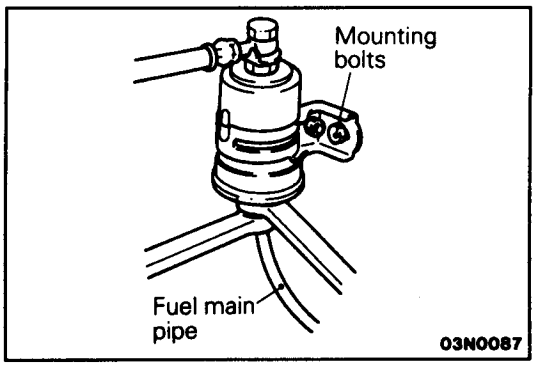
E13KBAM

4. REMOVAL OF EYE BOLT

Remove the eye bolt while holding the fuel filter nut securely.

Caution

Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

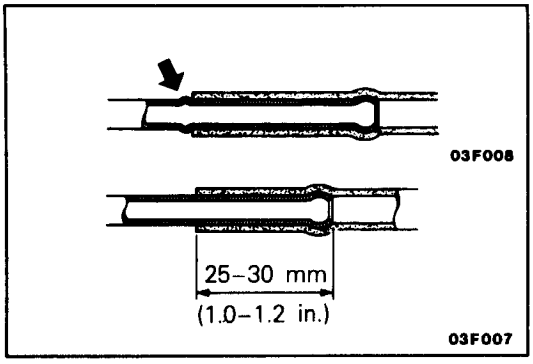


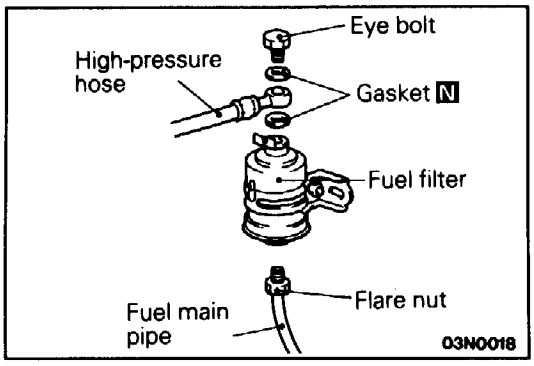
7. REMOVAL OF FUEL FILTER

(1) Loosen the main pipe flare nut while holding the fuel filter nut securely.
(2) Remove the fuel filter mounting bolts, and then remove the fuel filter from the bracket.

INSPECTION E13KCAR

- Check the hose and pipes for cracks, bend, deformation and clogging.
- Check the canister for clogging.
- Check the fuel filter for clogging and damage.





SERVICE POINTS OF INSTALLATION E13KDAZ

8. INSTALLATION OF FUEL RETURN HOSE / 2. PURGE HOSE / 1. VAPOR HOSE

(1) If the fuel pipe has a stepped part, connect the fuel hose to the pipe securely, up to the stepped part, as shown in the figure.
(2) If the fuel pipe does not have a stepped part, connect the fuel hose to the pipe securely, so that it is the standard value.

Standard value: 25–30 mm (1.0–1.2 in.)

7. INSTALLATION OF FUEL FILTER

(1) When installing the fuel filter, first temporarily install the filter to the filter bracket; then insert the main pipe at the connector part of the filter, and manually screw in the main pipe's flare nut.
(2) Holding the fuel filter nut, tighten the fuel main pipe's flare nut and eye bolt at the specified torque. Then tighten the filter to the bracket.

6. INSTALLATION OF O-RING/5. HIGH PRESSURE FUEL HOSE

(1) Apply a little amount of new engine oil to the O-ring.

Caution
Be sure to prevent the engine oil from entering into the delivery pipe.

(2) Insert the hose, being careful not to damage the O-ring, and tighten securely.

NOTE
Be sure to tighten securely to prevent fuel leaks so that there will be high pressure between the fuel pump and the delivery pipe.

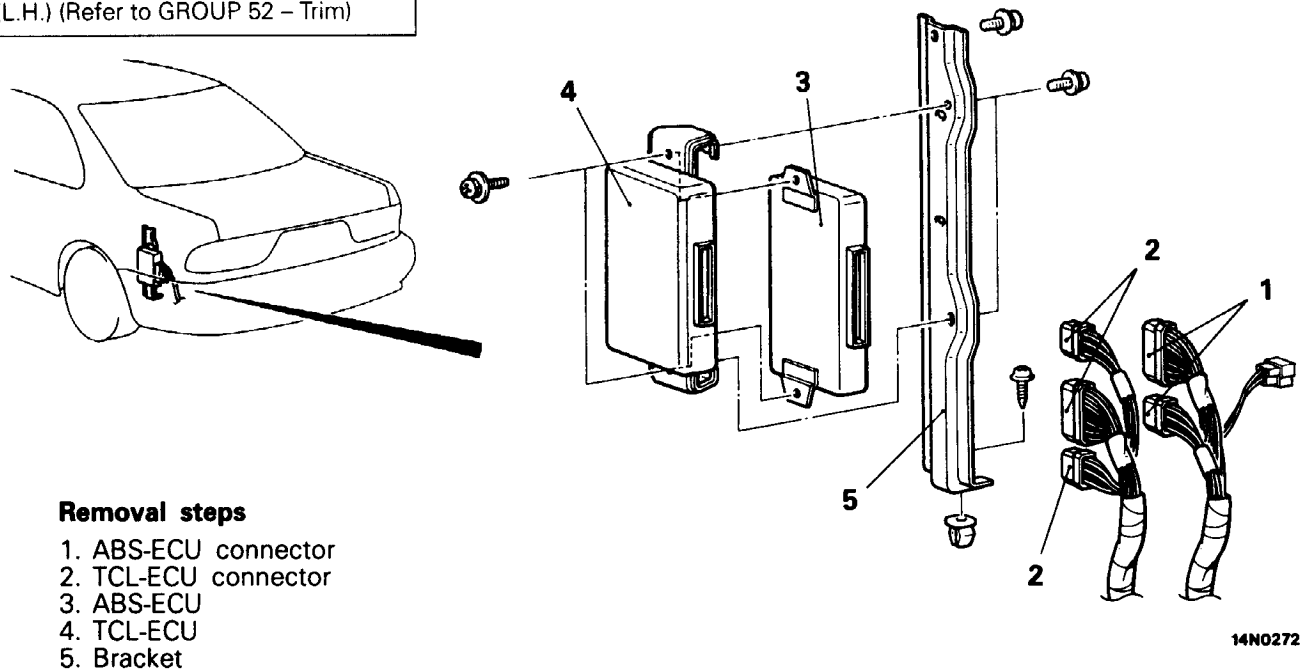
TCL CONTROL UNIT

E13RA--

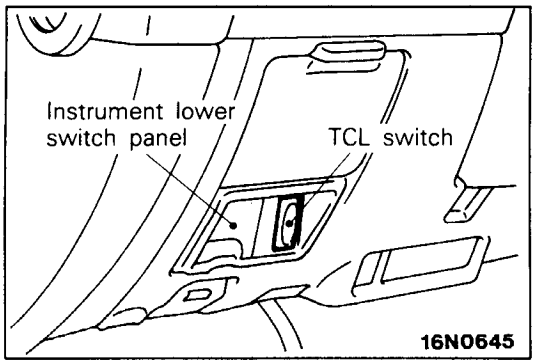
REMOVAL AND INSTALLATION

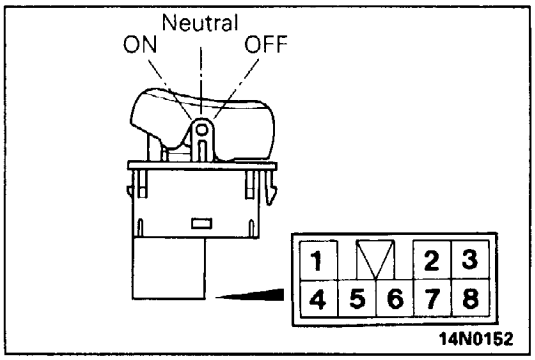
Pre-removal Operation
- Removal of the Trunk Side Trim (L.H.)(Refer to GROUP 52 – Trim)

Post-installation Operation
- Checking of the Anti-skid Brake System (Refer to GROUP 35 – Service Adjustment Procedures)
- Checking of the TCL System (Refer to P.13-51-1)
- Installation of the Trunk side Trim (L.H.) (Refer to GROUP 52 – Trim)



Removal steps
1. ABS-ECU connector
2. TCL-ECU connector
3. ABS-ECU
4. TCL-ECU
5. Bracket





TCL SWITCH

E13REAAa

INSPECTION

1. Remove the instrument lower switch panel.
2. Remove the TCL switch.

3. Operate the switch to check continuity between the terminals.

Switch position \ Connector terminal	1	2	3	4	7	8	5		6
ON				○		○			
Neutral							○	○	○
OFF		○		○					

NOTE
○—○ shows that there is continuity between the terminals.

HYDRAULIC UNIT <VEHICLES WITH TCL>

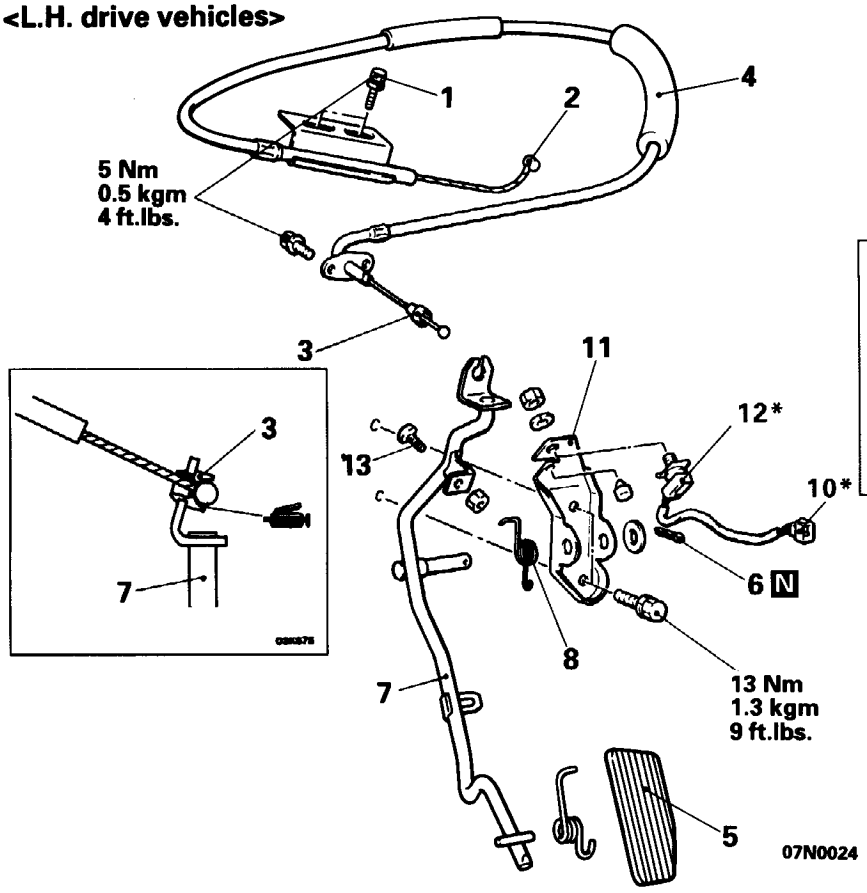
Refer to GROUP 35 – Hydraulic Unit <Vehicles with ABS>

ACCELERATOR CABLE AND PEDAL

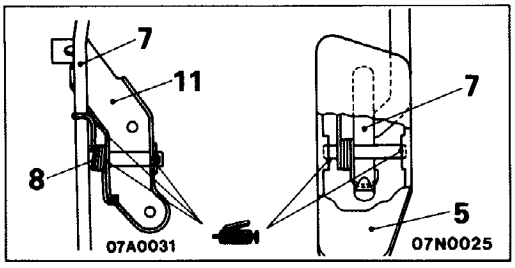
E13φA--

REMOVAL AND INSTALLATION

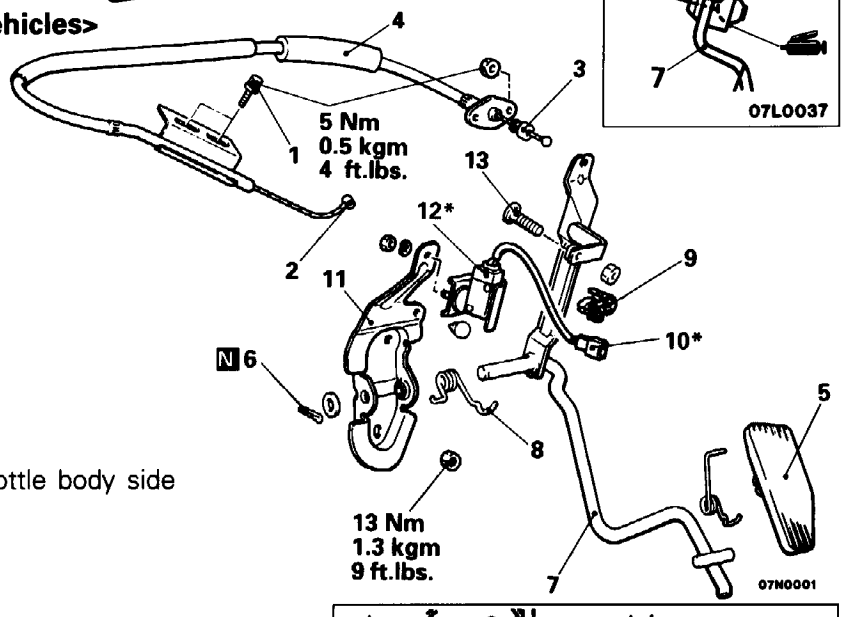
<L.H. drive vehicles>

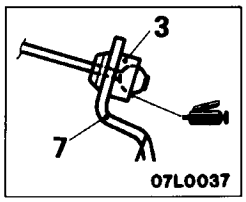


Post-installation Operation
- Adjusting the accelerator cable. (Refer to P.13-49.)
- Adjusting the accelerator switch A/T (Refer to GROUP 23 – Service Adjustment Procedures.)



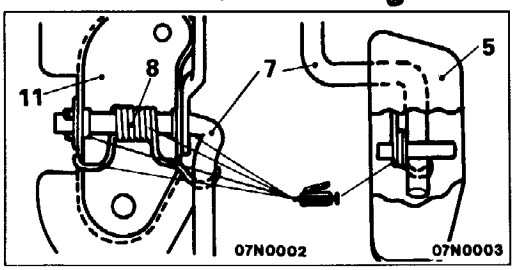
<R.H. drive vehicles>





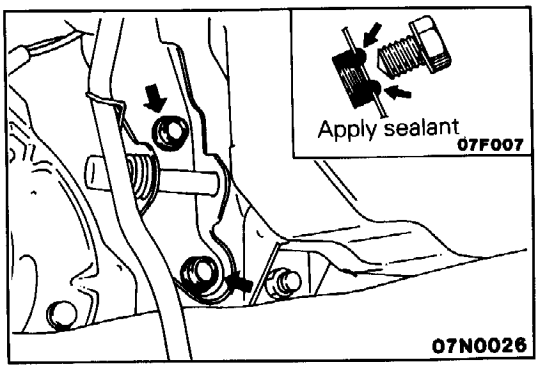
Removal steps
1. Adjusting bolt
2. Inner cable connection on throttle body side
3. Bush connection
4. Accelerator cable
5. Accelerator pedal
6. Split pin
7. Accelerator arm
8. Return spring
9. Clip <R.H. drive vehicles-A/T>
10. Harness connector* <A/T>
◆◆ 11. Accelerator arm bracket
12. Accelerator pedal switch* <A/T>
13. Adjusting bolt

NOTE
*: Vehicles built up to October, 1991



INSPECTION E13ϕCAL

- Check the inner and outer cable for damage.
- Check the cable for smooth movement.
- Check the accelerator arm for bending.
- Check the return spring for deterioration.
- Check the connection of bushing to end metal fitting.
- Check the accelerator switch for ON/OFF switching. <A/T>



SERVICE POINTS OF INSTALLATION E13ϕDAϕ

11. APPLICATION OF SEALANT TO ACCELERATOR ARM BRACKET <L.H. drive vehicles>

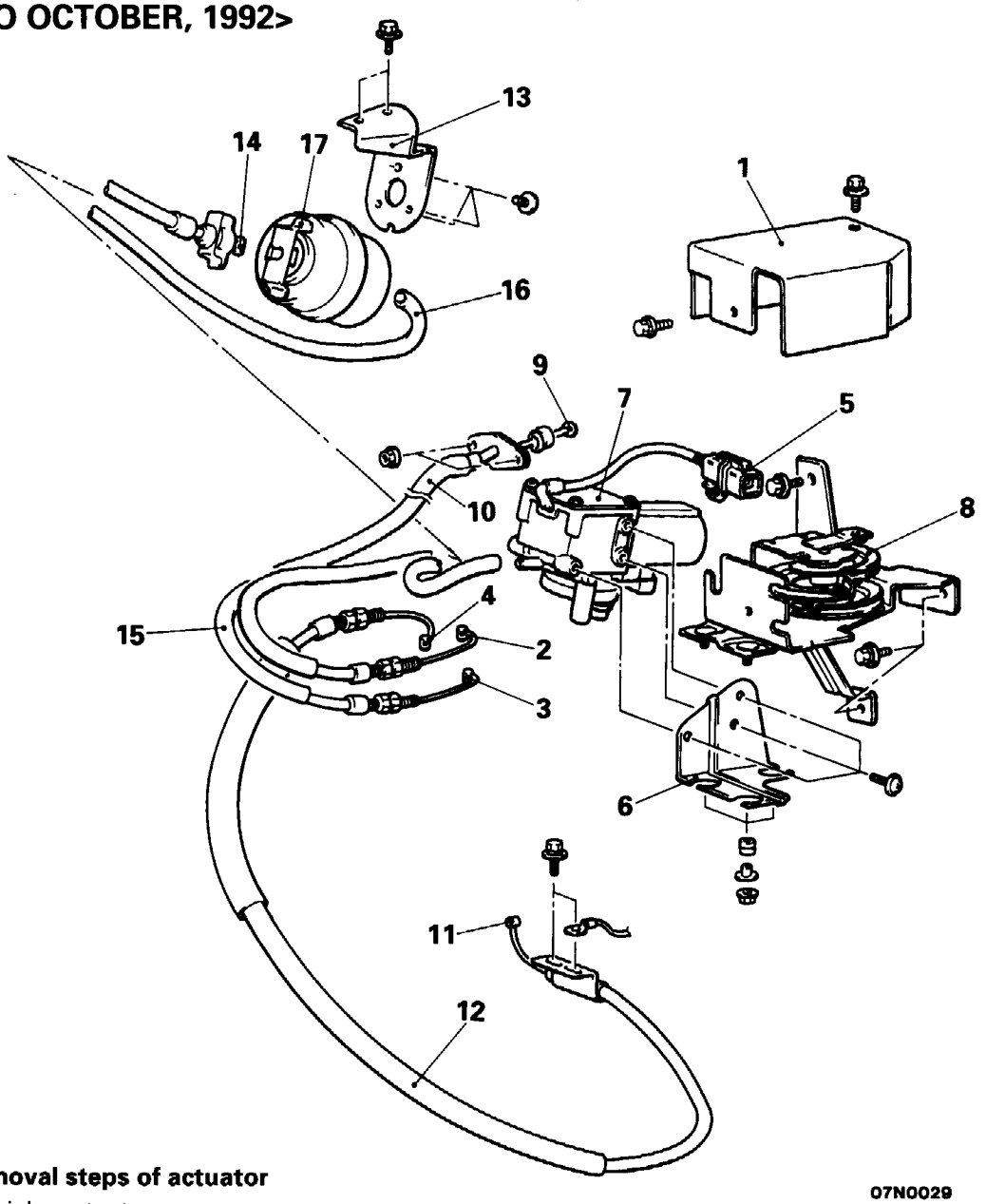
Apply drying sealant to the bolt mounting hole, and then tighten the accelerator arm bracket.

AUTO-CRUISE CONTROL

E13SA-

REMOVAL AND INSTALLATION

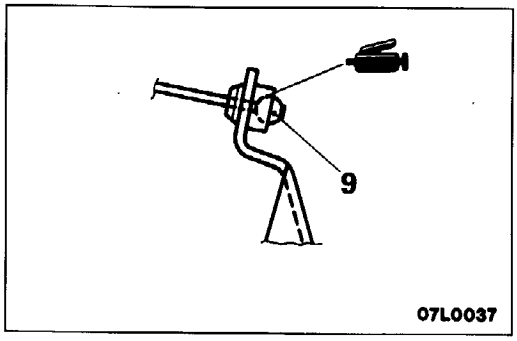
<L.H. DRIVE VEHICLES BUILT UP TO APRIL, 1994, R.H. DRIVE VEHICLES BUILT UP TO OCTOBER, 1992>



07N0029

Removal steps of actuator

1. Link protector
2. Accelerator cable and link assembly connection
3. Auto-cruise control cable and link assembly connection
4. Throttle cable and link assembly connection
5. Auto-cruise vacuum pump connector
6. Pump bracket
7. Auto-cruise vacuum pump assembly
8. Link assembly
9. Accelerator cable and pedal connection
10. ◆◆ Accelerator cable
11. Throttle cable and throttle body connection
12. ◆◆ Throttle cable
13. Actuator bracket
14. Auto-cruise control cable and actuator connection
15. ◆◆ Auto-cruise control cable
16. Vacuum hose
17. Actuator



07L0037

Removal steps of main switch

18. Instrument panel side switch
19. Main switch

Removal steps of control switch

<Vehicles without SRS>

20. Horn pad
21. Control switch

Removal steps of control switch
<Vehicles with SRS>

CAUTION: SRS
Before removal of air bag module, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

22. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring)
23. Air bag module bracket
24. Control switch

Pre-removal and post-installation operation (Control unit)

- Removal and installation of the floor console box (Refer to GROUP 52 – Floor Console.)

  CAUTION: SRS
  <L.H. drive vehicles>
  When removing and installing the floor console in vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or other components.
- Removal and installation of radio and tape player (Refer to GROUP 54 – Audio System.)

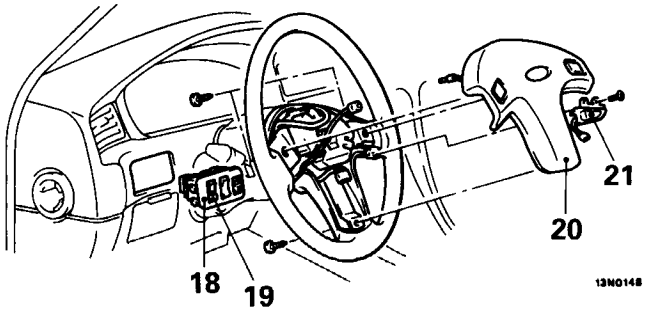
Removal of control unit

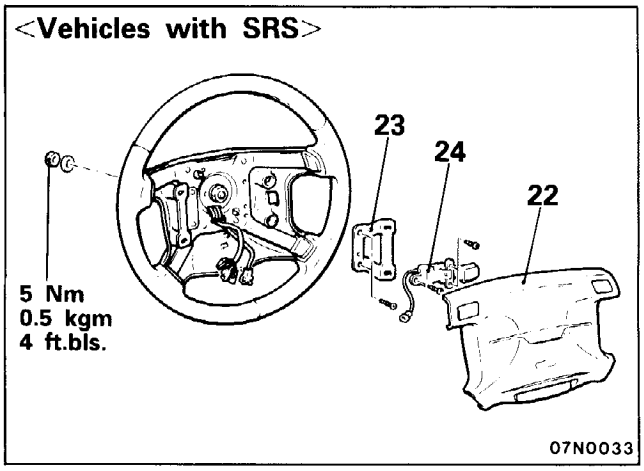
25. Control unit

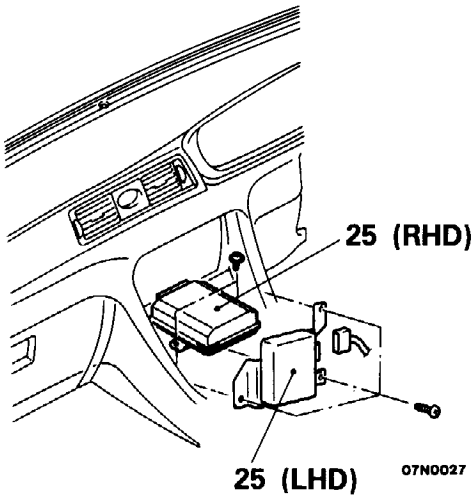
Removal of sensors and switches

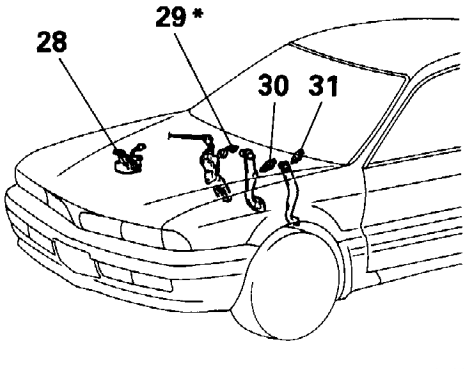
26. Throttle position sensor (buit-in idle switch)
27. Vehicle speed sensor
28. Inhibitor switch <A/T>
29. Accelerator pedal switch* <A/T>
30. Stop lamp switch
31. Clutch switch <M/T>

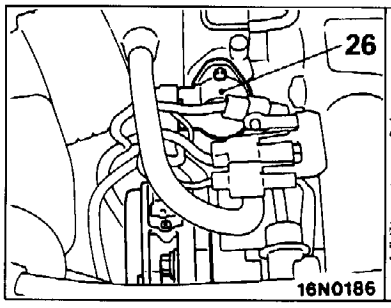
NOTE
*: Vehicles built up to October, 1991

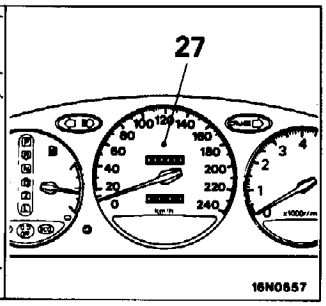


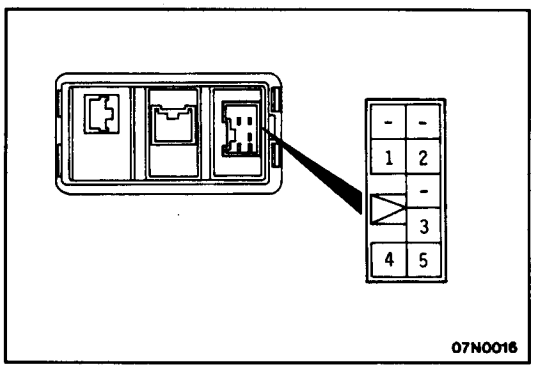












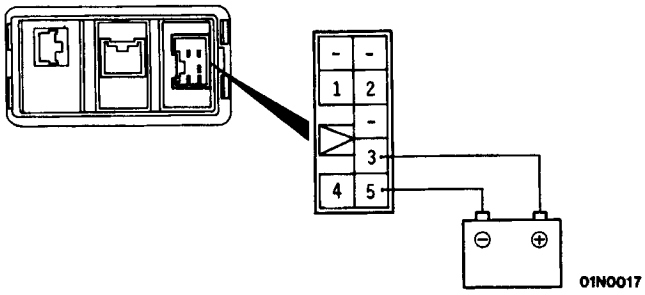
INSPECTION
INDIVIDUAL PARTS INSPECTION
AUTO-CRUISE CONTROL MAIN SWITCH

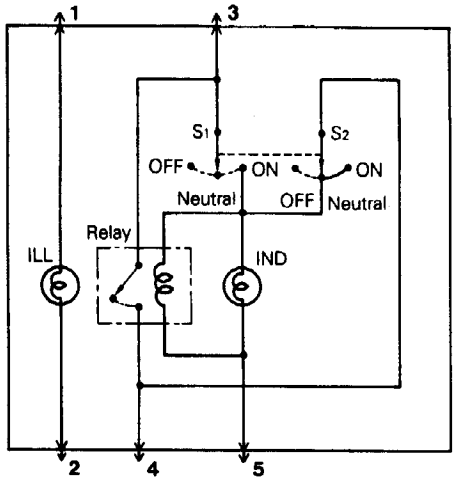
(1) Operate the switch and check for continuity between the terminals

Switch position \ Terminal	1	ILL	2	3	4	5
OFF	○	○	○			
Neutral	○	○	○		○	○
ON	○	○	○	○	○	○

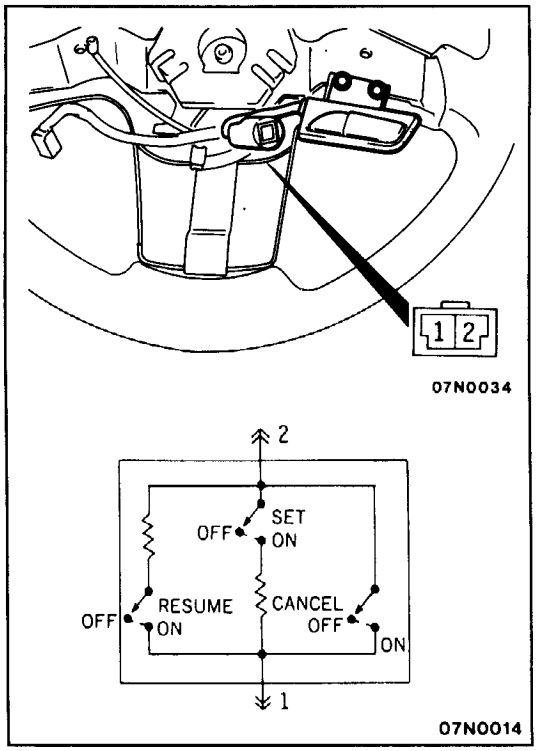
NOTE
○—○ indicates that there is continuity between the terminals.

(2) When the battery ⊕ side is connected to terminal ③ and the ⊖ side is connected to terminal ⑤, and the main switch is turned to ON, check if battery voltage is output between terminal ④ and the earth until the main switch is turned to OFF.
Next, when the main switch is turned to OFF, check if the battery voltage that was output between terminal ④ and the earth becomes 0V.





ILL: Illumination lamp
IND: Indicator lamp



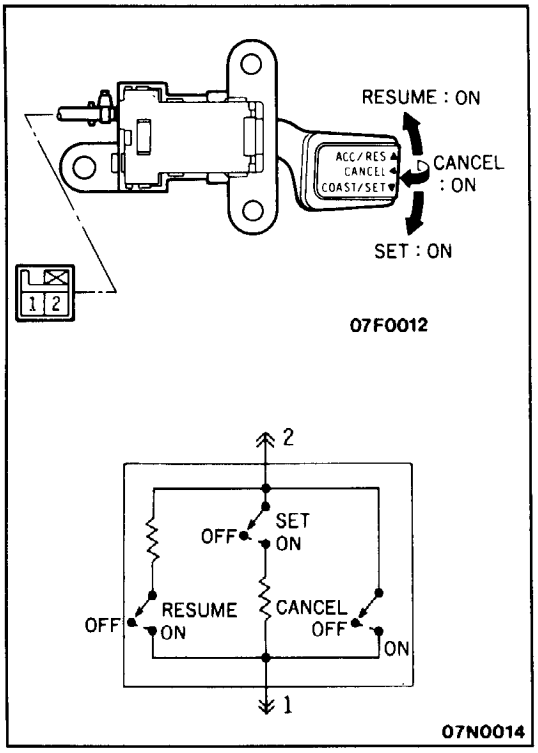
AUTO-CRUISE CONTROL SWITCH

<Vehicles without SRS>

(1) Remove the horn pad.

(2) Measure the resistance between the terminals when each of the SET, RESUME and CANCEL switches is pressed. If the values measured at this time correspond to those in the table below, then there is no problem.

Switch position	Resistance between terminals
Switch OFF	Nov continuity
CANCEL switch ON	Approx. 0 Ω
RESUME switch ON	Approx. 820 Ω
SET switch ON	Approx. 2700 Ω



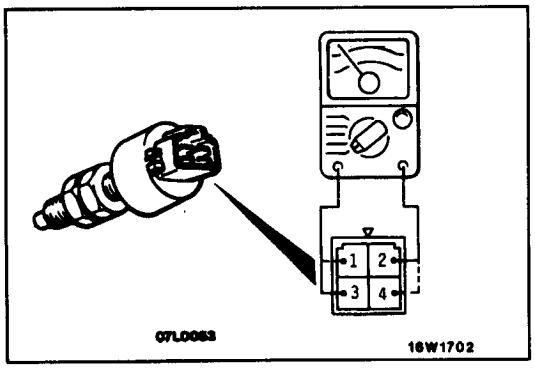
<Vehicle with SRS>

(1) Remove the air bag module.

Caution
Before removal of air bag module, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

(2) Measure the resistance between the terminals when each of the SET, RESUME and CANCEL switches is turned to ON.
If the values measured at this time correspond to those in the table below, then there is no problem.

Switch position	Resistance between terminals
When switch is not operated	No continuity
When switch is operated toward (CANCEL switch ON)	Approx. 0 Ω
When switch is operated upward (RESUME switch ON)	Approx. 820 Ω
When switch is operated downward (SET switch ON)	Approx. 2700 Ω

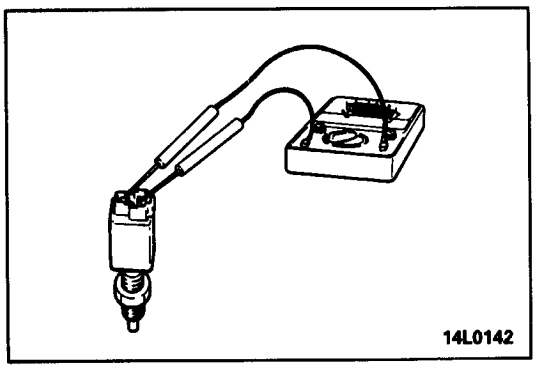


STOP LAMP SWITCH

(1) Diconnect the connector.
(2) Check for continuity between the terminals of the switch.

Switch / Terminal / Measurement conditions	For stop lamp circuit		For auto-cruise control circuit	
	2	3	1	4
When brake pedal depressed.	○—○			
When brake pedal not depressed.			○—○	

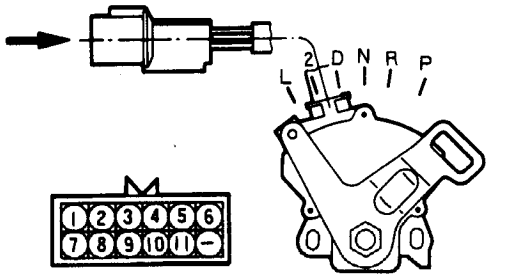
NOTE
○—○ indicates that there is continuity between the terminals.



CLUTCH SWITCH CHECK <M/T>

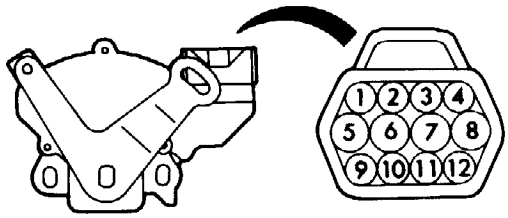
(1) Remove the clutch switch connector.
(2) Check if there is continuity between the clutch switch terminals while the clutch pedal is depressed, and if there is no continuity when the clutch pedal is released.

<Vehicles built up to October, 1992>



TFA0359

<Vehicles built from November, 1992>



TFA0958

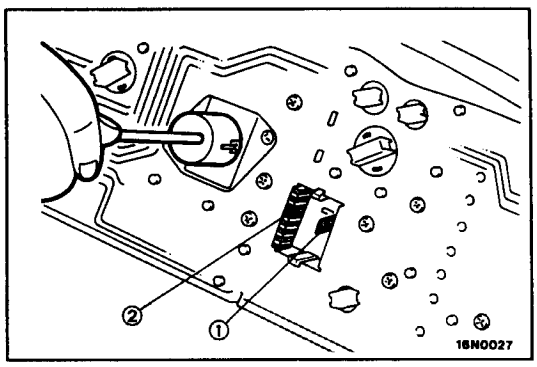
INHIBITOR SWITCH ("N" POSITION)

<Vehicles built up to October, 1992>

(1) Disconnect the connector.
(2) Check to be sure that there is continuity between connector terminals 8 and 9 when the selector lever is moved to the "N" range.

<Vehicles built from November, 1992>

(1) Disconnect the connector.
(2) Check to be sure that there is continuity between connector terminals 7 and 8 when the selector lever is moved to the "N" range.



16N0027

THROTTLE POSITION SENSOR

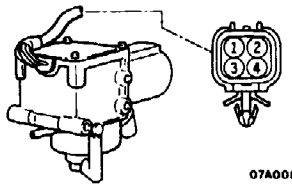
Refer to P.13-43, 45.

IDLE SWITCH

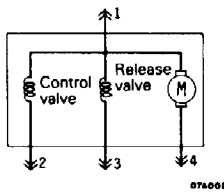
Refer to P.13-43, 45.

VEHICLE SPEED SENSOR

(1) Remove the combination meter.
(2) When using a (⊖) driver [width 2.9 mm (0.11 in.)] to turn the speed meter shaft, check if there is alternately continuity and then no continuity between terminals ① and ②.



07A0051



07A0050

AUTO-CRUISE VACUUM PUMP

INSPECTION OF SOLENOID VALVE (CONTROL VALVE, RELEASE VALVE)

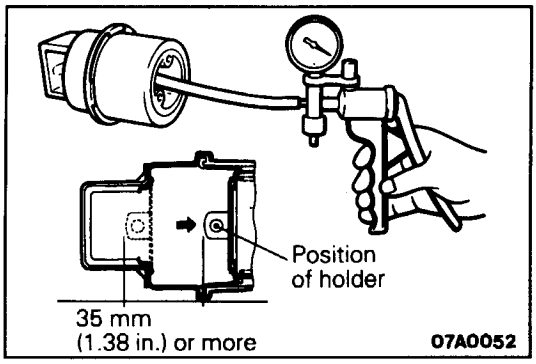
(1) Remove the auto-cruise vacuum pump connector.
(2) Measure the resistance value between terminals ① – ② and between ① – ③.

Standard value: 50–60Ω

(3) Check that the solenoid valve makes an operating noise when battery voltage is impressed between terminals ① – ② and between ① – ③.
(4) If there is a malfunction of the soleniod valve, replace the auto-cruise vacuum pump assembly.

MOTOR INSPECTION

(1) Remove the auto-cruise vacuum pump connector.
(2) Check that the motor revolves when battery voltage is impressed between terminals ① – ④.



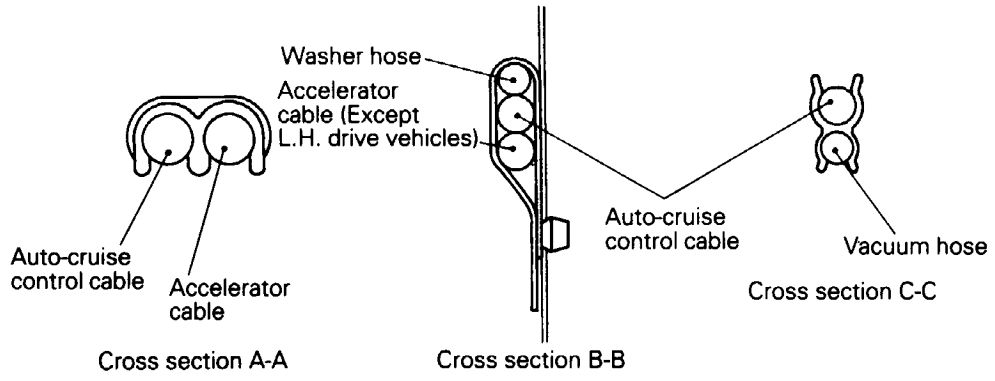
ACTUATOR INSPECTION

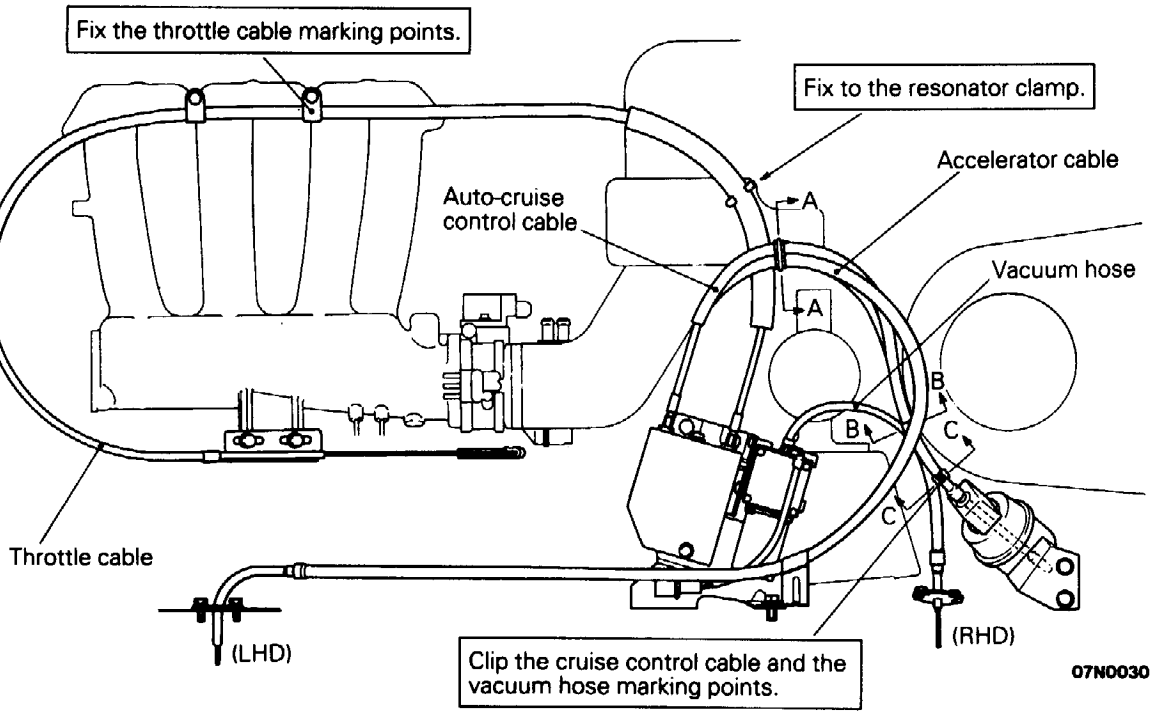
(1) Remove the actuator.
(2) Apply negative pressure to the actuator with the vacuum pump and check that the holder moves more than 35 mm (1.38 in.). In addition, check that there is no change in the position of the holder when negative pressure is maintained in that condition.
(3) First install the actuator and then inspect and adjust the auto-cruise control cable (Refer to P.13-49.)

SERVICE POINTS OF INSTALLATION

15. INSTALLATION OF AUTO-CRUISE CONTROL CABLE/12. THROTTLE CABLE/10. ACCELERATOR CABLE

Connect each cable as shown in the diagram.



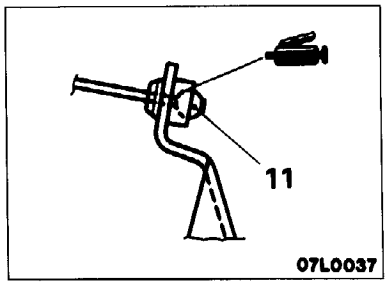


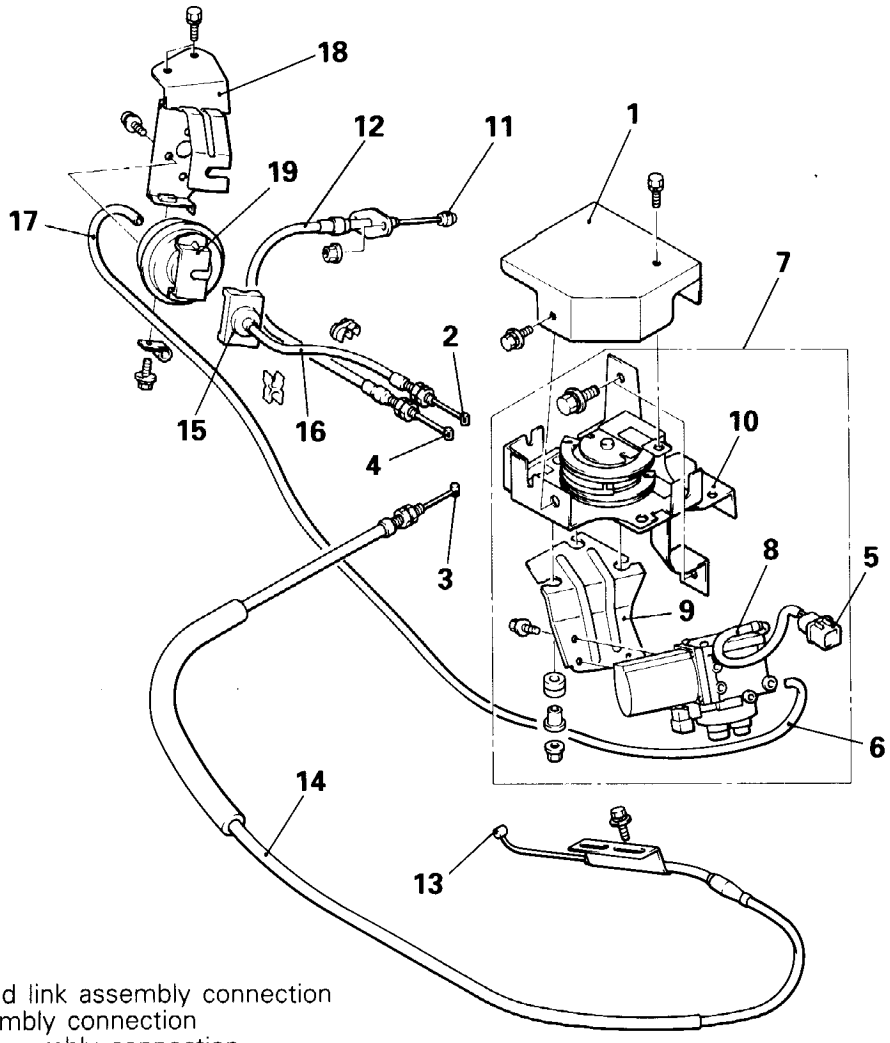
E13SA-A

REMOVAL AND INSTALLATION

<R.H. DRIVE VEHICLES BUILT FROM NOVEMBER, 1992>

Pre-removal Operation
- Adjustment of Auto-cruise Control Cables (Refer to P. 13-52)

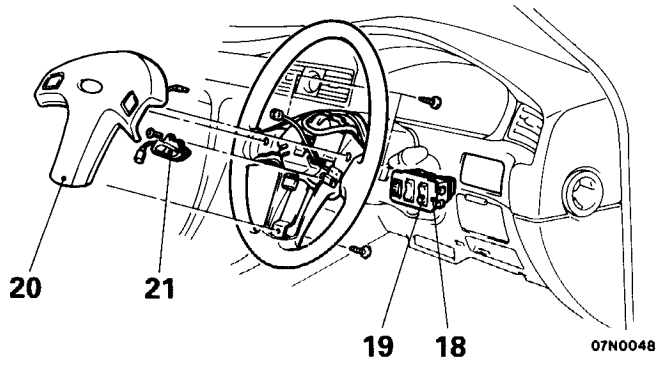




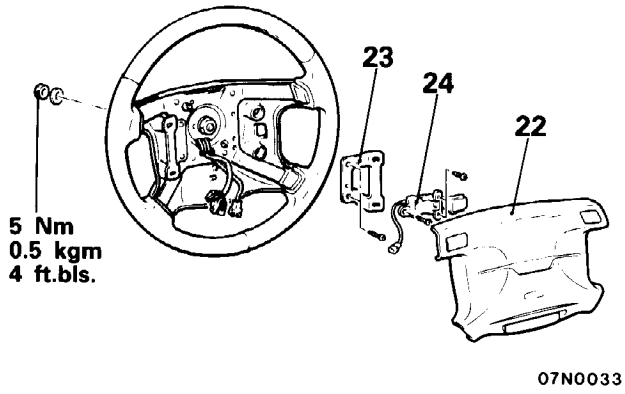
Removal steps of actuator

1. Link protector
2. Auto-cruise control cable and link assembly connection
3. Throttle cable and link assembly connection
4. Accelerator cable and link assembly connection
5. Auto-cruise vacuum pump connector
6. Vacuum hose and vacuum pump connection
7. Link and vacuum pump assembly
8. Auto-cruise vacuum pump assembly
9. Pump bracket
10. Link assembly
11. Accelerator cable and pedal connection
12. Accelerator cable
13. Throttle cable and throttle body connection
14. Throttle cable
15. Auto-cruise control cable and actuator connection
16. Auto-cruise control cable
17. Vacuum hose
18. Actuator bracket
19. Actuator

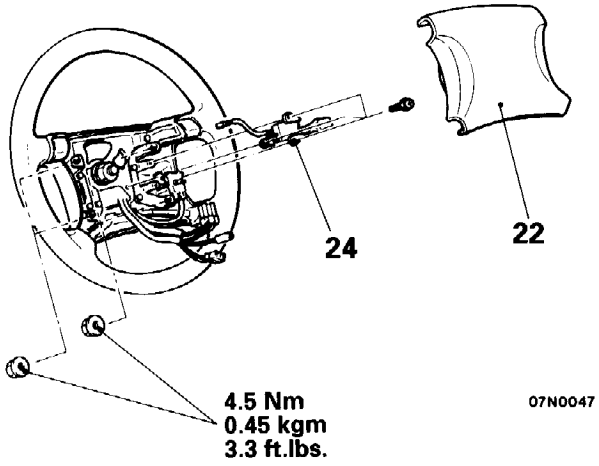
<Vehicles without SRS>



<Vehicles with SRS built up to April, 1994>



<Vehicles with SRS built from May, 1994>



Removal steps of main switch

18. Instrument panel side switch
19. Main switch

Removal steps of control switch

<Vehicles without SRS>

20. Horn pad
21. Control switch

Removal steps of control switch
<Vehicles with SRS>

CAUTION: SRS
Before removal of air bag module, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

22. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring)
23. Air bag module bracket
24. Control switch

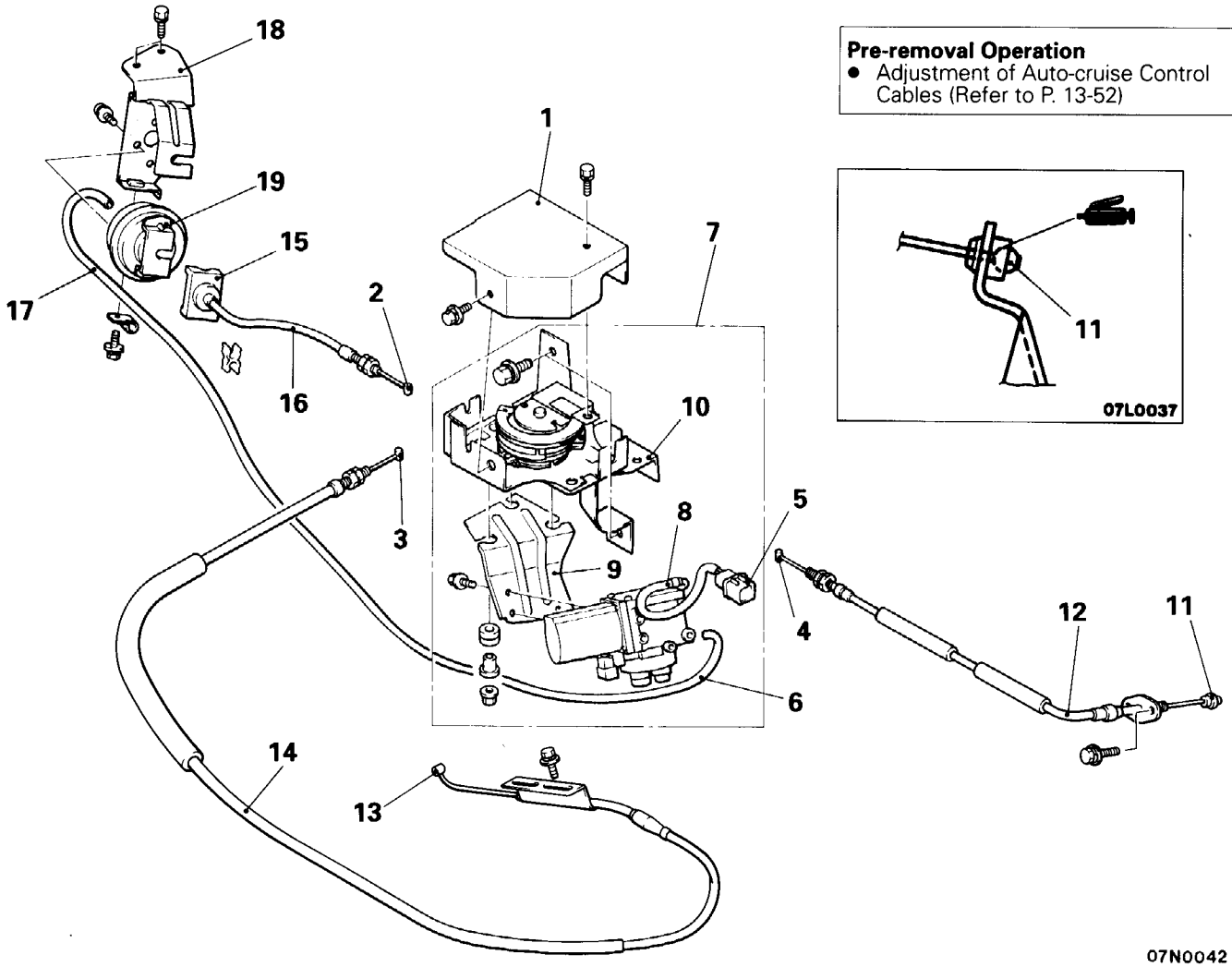
NOTE
For information concerning control unit, sensors and switches, refer to P.13-152.

INSPECTION

Refer to P.13-153.

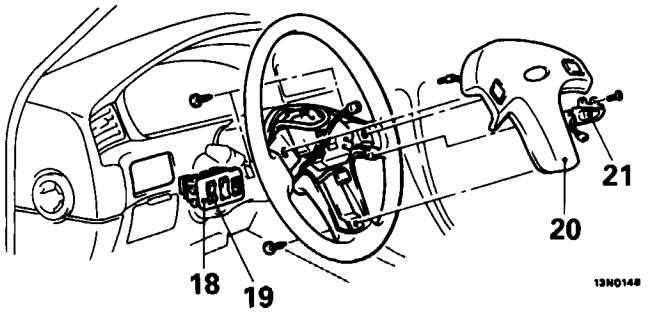
REMOVAL AND INSTALLATION <L.H. DRIVE VEHICLES BUILT FROM MAY, 1994>

Pre-removal Operation
- Adjustment of Auto-cruise Control Cables (Refer to P. 13-52)



Removal steps of actuator

1. Link protector
2. Auto-cruise control cable and link assembly connection
3. Throttle cable and link assembly connection
4. Accelerator cable and link assembly connection
5. Auto-cruise vacuum pump connector
6. Vacuum hose and vacuum pump connection
7. Link and vacuum pump assembly
8. Auto-cruise vacuum pump assembly
9. Pump bracket
10. Link assembly
11. Accelerator cable and pedal connection
12. Accelerator cable
13. Throttle cable and throttle body connection
14. Throttle cable
15. Auto-cruise control cable and actuator connection
16. Auto-cruise control cable
17. Vacuum hose
18. Actuator bracket
19. Actuator



Removal steps of main switch

18. Instrument panel side switch
19. Main switch

Removal steps of control switch

<Vehicles without SRS>

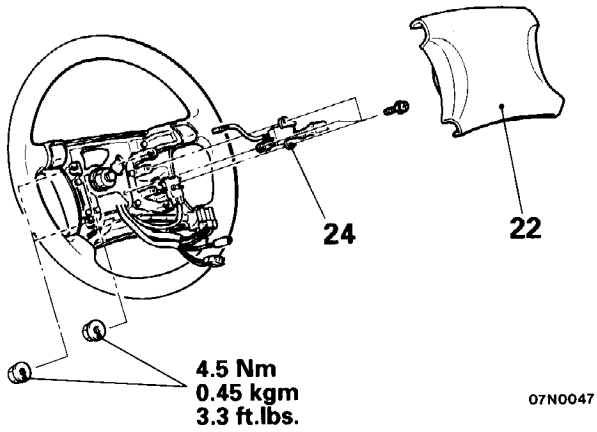
20. Horn pad
21. Control switch

Removal steps of control switch
<Vehicles with SRS>

CAUTION: SRS
Before removal of air bag module, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

22. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring)
24. Control switch

<Vehicles with SRS>



NOTE
For information concerning control unit, sensors and switches, refer to P.13-152.

INSPECTION

Refer to P.13-153.